

300184

JPRSEST 86008

JPRS-EST-86-008

18 JUNE 1986

Europe Report

SCIENCE AND TECHNOLOGY

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DTIC QUALITY INSPECTED 2

19980218 122

FBIS

FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA. 22161

109

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

18 JUNE 1986

EUROPE REPORT
SCIENCE AND TECHNOLOGY

CONTENTS

WEST EUROPE

BIOTECHNOLOGY

Briefs

French Biotech Action Program	1
-------------------------------	---

CIVIL AVIATION

Aeritalia: Avionics, Optoelectronics Research, ATR 42 (Alberto Mondini; SCIENZA DUEMILA, No 4, Apr 86).....	2
--	---

COMPUTERS

Bull, Universities, Labs Share AI Software, Hardware R&D (ZERO UN INFORMATIQUE, 17 Mar 86).....	6
French R&D Financing Structures: Electronics, Computers (Philippe Moins; ZERO UN INFORMATIQUE, 17 Mar 86).....	10
Bull's Isis Supercomputer in Final Construction Stage (ZERO UN INFORMATIQUE, 17 Mar 86).....	17

DEFENSE INDUSTRIES

Diehl Weapons Lab Works on Sensors, Lasers, Flight Control (Wolfgang Flume; WEHRTECHNIK, Apr 86).....	25
Properties, Applications, Future of European Gyro Sensors (Werner Hansli; WEHRTECHNIK, Apr 86).....	29

MICROELECTRONICS

Briefs

FRG Megabit Research Funding	33
------------------------------	----

SCIENTIFIC AND INDUSTRIAL POLICY

CSELT Undertakes Esprit, Race Projects, Local R&D Efforts (MEDIA DUEMILA, Mar 86).....	34
---	----

Danish Government Allocates 1.5 Billion for High Technology (Jens J. Kjaergaard; BERLINGSKE TIDENDE, 24 Apr 86).....	36
---	----

Italian S&T Ministry Funds Corporate Research Efforts (GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA, 12 Feb 86).....	37
--	----

Italian Government Publishes Resolution on Research Studies (GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA, 22 Apr 86).....	47
--	----

ITALTEL's Bellisario Announces Aggressive Strategy (Marisa Bellisario; NOTIZIE ITALTEL, Feb 86).....	53
---	----

ITALTEL's 5-Year Plan Emphasizes Telematics, Exports (NOTIZIE ITALTEL, Feb 86).....	55
--	----

ITALTEL, ALCATEL, Plessey, Siemens Expand R&D Cooperation (NOTIZIE ITALTEL, Feb 86).....	61
---	----

Permanent FRG Commission on Technology Assessment Proposed (G. Hartmut Altenmueller; VDI NACHRICHTEN, 11 Apr 86)....	62
---	----

FRG Contribution to R&D in 1985 DM 52.2 Million (TAGESSPIEGEL, 12 Apr 86).....	64
---	----

FRG Key Technologies Growth, Development Potential Reviewed (HANDELSBLATT, 12 Apr 86).....	65
---	----

Briefs

New Esprit Projects Under Way	67
-------------------------------	----

TECHNOLOGY TRANSFER

FRG Agrees to High Technology Export Controls (DPA, 18 Apr 86).....	68
--	----

Finnish Valmet To Participate in Eurobot Project of Eureka (KANSAN UUTISET, 9 May 86).....	70
---	----

EAST EUROPE

BIOTECHNOLOGY

Bulgarian Microbiology Institute's Enzyme Production (Milen Beshkov, et al.; SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE, No 6, 1985).....	71
GDR Institute Develops Materials for Artificial Organs (Robert Becker; SPECTRUM, No 1, 1986).....	78

COMPUTERS

Establishment of GDR Informatics Society (MESSEN-STEURN-REGELN, No 1, Jan 86; VERMESSUNGSTECHNIK, No 10, Oct 85).....	83
General Data Provided	83
Subordinate to Academy of Sciences	84
Anonymous Specialist Decries Polish Computerization Efforts (WPROST, Feb 86).....	88

FACTORY AUTOMATION

Electronic Control Systems for CSSR Machine Tools (Vladimir Vurm Interview; TECHNICKY TYDENIK, No 13, 25 Mar 86).....	94
---	----

LASERS, SENSORS, AND OPTICS

Specialists Discuss Lasers at GDR Meeting (SPECTRUM, No 2, 1986).....	99
--	----

/12223

WEST EUROPE/BIOTECHNOLOGY

BRIEFS

FRENCH BIOTECH ACTION PROGRAM--Biotechnology: Europe is Getting Organized. Brussels Proposes Research Programs. Since 1985, the European Communities Commission has established a research program, under the direction of Fernand Van Hoecke, that has the difficult task of promoting interdiscipline research among industrial, agricultural and university sectors, and of trying to solve the problems concerning the regulations and filing of patents (CUBE program). The BAP (Biotechnology Action Program) research and development program is starting this year with a budget of 55 million ecus (a relatively small sum when compared to the 750 million ecus of the Esprit program, but the following coming from national programs must be added to this amount, for example Fr 1 billion for France in 1986). This program has already received 1300 proposals, 200 of which are already supported by the ECC. Finally the Biceps program is organizing the application of data processing to biomedical research and, above all, is closely watching current research on the use of organic molecules in electronics (the almost mythical biotransistors). [Excerpt] [Paris LE FIGARO in French 5/6 Apr 86 p 20] 12260/12948

CSO: 3698/436

WEST EUROPE/CIVIL AVIATION

AERITALIA: AVIONICS, OPTOELECTRONICS RESEARCH, ATR 42

Rome SCIENZA DUEMILA in Italian No 4, April 86 pp 30-33

[Article by Alberto Mondini: "On the Wings of the Future"]

[Excerpts] No industry compares with aerospace, where planners risk so much: They need to develop designs that will still be applicable in 20 years, (in a field where time really does "fly by") and considerable sums of money are needed as well as work and research. Although it may be said that research helps to cut down the risk factor, this is only partly true. From the outset, research is directed into a few known areas and specialization increasingly tends to be one-dimensional.

This is something that today affects only top industries like Aeritalia. While they manufactured under license, as was the case with the F104, the risks were lower (although we paid a high toll for it) and the research had already been carried out by others.

But with the Tornado project, and still more with the EFA, we can only make suppositions. The Tornado has been a success, and we are hoping that the EFA will become the European fighter aircraft of the future. We saw the wing of this "trailblazer" at the Aeritalia plant in Turin, Control Aircraft Unit. A substantial part of the primary structure of this wing is made from carbon fiber which yields weight savings of 20 percent compared with those manufactured entirely of metal.

The shape of the wing is also characteristic, that is, double-delta design, to cope with supersonic flight, but also to provide maximum maneuverability at low speeds. The EFA program is at present being carried out by four nations--West Germany, Great Britain, Italy (who are involved on the Tornado project) and Spain; but participation by other European countries like Belgium and the Netherlands cannot be ruled out. Also France and the United States would like to have a "little slice" but the proposal puts the "founder members" in an awkward situation. The EFA will replace the F104 in Italy, and the Phantom, Jaguar, Buccaneer and possibly the F16 in other countries. Its active life should begin around 1995 if the four participants give the go-ahead this summer and should then continue for at least 15 years into the new century. Variants and engine replacements give a military aircraft 20 and a few more years of service life. Around 1,000 aircraft have been ordered

which justifies the international cooperation, despite the complications and added costs created by the need of an agreement between the various mentalities and languages and strategic and industrial concentrations. The Tornado is at present in production at the Combat Aircraft Unit and has been favorably received by the air forces of the three participating nations. It also has been an object of export and of great interest from half of the world's air force general staffs. The Avionic Systems and Equipment Unit is located in Torino Caselle (Turin), which last year celebrated its 30th birthday. However, the traditions it has inherited go back much further, 120 years in fact, to when Ignazio Porro, a scientist, and Salmoiraghi, an engineer, founded the "Filotecnica," an optical instrument factory. In 1969, this factory was absorbed into the Aeritalia instrument division. GEQ, a name much mentioned recently in connection with the delivery to the Azienda Autonoma Assistenza di Volo [Flight Navigation Instruments Limited] of new navigation instruments for installation on board the Cessna Citation II, is a body that carries out particularly interesting research and development which we shall only summarize here. We shall begin by looking at the radar and infrared "signs" and see what it is.

The first step consists of identifying the echo measurement that each airplane produces in a radar (radar cross section). This depends on the nature of the area and the shape of the aircraft and varies according to the direction of the aircraft in line with the radar, i.e.; if the aircraft is head-on, the echo is minimal; side on it is maximum, and so on. The laboratories at Caselle are taking readings with the intention of minimizing the echo throughout all the different axes, in order to smooth out the shape of the aircraft as much as possible.

Another GEQ project is the study of electromagnetic compatibility. As every student knows, a live electric wire is surrounded by a magnetic force field. With an AC current the force field varies with the variation of the current and creates another electric current in the neutral leads next to it. This is a well known feature and is an infinite source of disturbance and complications, especially where hundreds of electric wires must stay together. To the observer, the interior of any modern aircraft just seems to be full of "bundles of spaghetti." The electro-magnetic compatibility must be checked; furthermore signals from the antennas, the efficiency of the radomes and the electro-magnetic properties of new materials like carbofiber need to be studied too. However, the days of the "spaghetti" mentioned above are numbered. This is because of the increasing use being made of the "data bus," a sensor that transmits data from one point on the aircraft to another, like passengers on a bus, each getting off at his stop. This too is undergoing research at the Caselle laboratories.

Optical fibers, the system whereby data travels in the form of light impulses without creating magnetic fields, are advancing overbearingly, and further experimentation has to be carried out in this field. In the course of the year it is planned to install the first European optical fiber system on board a G-222 aircraft of the Italian Air Force. This experiment will be the start of a new phase of study for the installation of a complete optical fiber system on board an advanced aircraft.

Optical fibers will be used in the near future to transmit the pilot commands from the joystick, pedals and other cockpit controls to the various activators located throughout the aircraft. The pilot will eventually "fly by light." Meanwhile the system of transmitting these signals by electronics (fly by wire) is at present being extended on modern aircraft. This is the type of system used on the Italian (and Brazilian) AMX aircraft, and the electronic units have been developed at Caselle. The "bus" described earlier is also used on this plane as well as a main on-board computer which calculates targeting weapons, navigation and avionic systems control. All this too comes from Caselle. The microprocessors that this equipment uses were researched and developed by GEQ, and the integration and trials of the AMX avionic system were done using a full test bench operated in real time by an extremely elaborate computer.

It is well known that electronic systems can be equipped with "self diagnostic" devices which automatically show the time and place of any fault. Their acronym is ATE, (Automatic Test Equipment) and their usefulness is easy to understand. In fact the number and complexity of the electronic instruments on board a modern aircraft would make it necessary, were it not for ATE, to choose between two impossible alternatives--either check all critical points with a voltmeter, or take off without being sure that these vital systems are working properly. With ATE you know immediately if something is working or not; and if not, it can be replaced immediately because you know where the fault lies. ATE systems which have been designed and developed by Aeritalia Equipment Division have been used on the Tornado and the product has aroused the interest of the RAF. A far cry from the days when we only worked under license! And yet, that was only a few years ago.

Finally, GEQ is also involved in optoelectronics, with telematic laser targeting equipment for armored vehicles, and with TV readout units. This research has given birth to an automatic computerized system for hypothermia which has been applied with excellent results in the treatment of cancers. This is a different area, far from the ones the company normally works in, but one to which its engineers have turned with passion and commitment.

A very important agreement is the one made between Aeritalia and the French Aerospatiale for the production of the turboprop ATR 42; the participation is equal, with 50 percent going to each company. We have described this aircraft in other articles but let us remember here that it is having a great deal of success; it has just gone into service with the French company Air Littoral, which has used it on the Bezieres--Paris run. Its results have been better than expected, both in the distance needed for takeoff and landing and in terms of economy, as well as for the altitude reached with only one motor.

The stalling speed (V_2) on takeoff is 106 knots and landing speed is only 92 knots. The two industries have agreed on the construction of the ATR 72, a 72 seater variation and the two versions have so far gathered 84 firm orders and 35 options of which 35 orders are from the United States, a difficult market to enter but a highly profitable one when you are successful. The break-even point (the point after which sufficient units are produced to cover

the expenses, and after which profit is involved), is around 350 and it is hoped to surpass it.

Production has been divided between Casoria, where all the sheet metal work is carried out, Foggia, where all the composite materials work is done, Pomigliano d'Arco, which is concerned with research and also assembles the entire fuselage, and Capodichino where, on the final assembly line, the wings and motors are mounted and test flights are carried out. In Pomigliano we saw an ATR 42, complete with wings, undergoing fatigue tests. Up to that moment it had completed 45,044 simulated flights, out of a total of 140,000. (The aircraft is guaranteed for 70,000 flights).

In April 1987 the experimental MD 80 with one propfan engine and one "normal" turbofan engine should start flying. The propfan is a new type of propeller with short blades and a special shape. It is also known as "the unducted fan." In the McDonnell-Aeritalia project huge, multi-bladed, counter-rotating propellers are used. The aim of this new technique is fuel saving; optimists forecast a savings of 30 percent over the best turbofans and 50 percent over the motors used on the series 30 DC9.

An airliner, not an experimental aircraft, with two propfans should be built immediately after this series of tests, and should obtain its certificate in 1992. For the experiments Aeritalia have sent "30 men of high quality, 29 Neapolitans and one Piedmontese" to Los Angeles. They will collaborate in the designing of the fuselage and of the engine support pylons. This cooperation with McDonnell Douglas began in 1966; since then, over 1,000 complete series of fuselage structural panels have been built. But since 1983 the nature of this collaboration has changed and it now continues with design and development, the building of the fins, the rudders and the aerilons in composite materials of the MD80. This program, like that for the spoilers of the B 727, and for some motor support elements and some parts of the wing and fuselage covering the B 747, have allowed Aeritalia to acquire a mass-production capacity for civil aircraft.

8623/12947

CSO: 3698/M111

WEST EUROPE/ COMPUTERS

BULL, UNIVERSITIES, LABS SHARE AI SOFTWARE, HARDWARE R&D

Paris ZERO UN INFORMATIQUE in French 17 Mar 86 pp 65-66

[Article by P.L: "Research at Bull - The Offensive in Artificial Intelligence"; first paragraph is introduction]

[Text] Bull, alas, does not have at its disposal the resources particular to big American companies. To reach its objectives, the French manufacturer relying on help from universities.

Data-processing research does not exist only in universities or in public laboratories. It is also done by big manufacturers. The great names of the world computer industry come immediately to mind--IBM, DEC, H-P, Fujitsu, etc.--but, closer to us, the Bull group carries out appreciable research activities, directed of course, in the short or intermediate term, toward marketable products. That is manufacturer's foremost inclination.

Of course, the Bull group does not have the research resources of IBM. However, both manufacturers devote roughly the same portion of their revenues to research and development: 10 percent. But their respective revenues are in no way comparable. In 1984, IBM devoted close to FR 40 billion to research and development, Bull only FR 1,4 billion. IBM's research budget is approximately three times higher than the total revenues of the Bull group. (Footnote) (In 1984 Bull's revenues were FR 13.6 billion.) Under these conditions, how can one stay in the race? By relying on help from public research. This is currently the Bull groups's policy; it has established a strong relationship with university or para-university laboratories, in particular with INRIA [National Institute for Data Processing and Automation].

To what fields is the Bull group applying its research? The least known of the French manufacturer's fields of research is perhaps that of artificial intelligence.

Indeed, in January 1985, the Bull group created an artificial intelligence commission that is assigned to Alice Recoque.

This temporary commission--it ends in March 1986--had as its objective to establish a whole new line of artificial intelligence products. They will be announced next April. We can already give a general idea of the French

manufacturer's concerns in that field. They revolve mainly around the following activities:

- understanding natural language: the Bull group has undertaken the development of a grammar written in Prolog II, aimed at understanding French. The origin of this product is found in Salkoff's linguistic work;
- knowledge representation languages: the designing of Kool (knowledge representation object-oriented language) should be finished, as well as its implementation in Lisp for the SPS7 (alias SM 90). A Mulisp version is also said to exist for the Micral 30. Validated in several application fields, in particular that of computer configuration, Kool should result in a commercial product;
- applications to expert systems: from the above-mentioned Kool language and from the Dool language, specially designed to express configuration semantics, Bull is at the moment developing the Spec project. The tools and techniques thus developed should serve as a starting point for an important Bull-Systems project;
- implementation of Prolog: this is one of the Bull group's pet projects. According to Alice Recoque, "from now on, no manufacturer will dare any more to provide a machine without Lisp and Prolog." According to the head of the Bull AI project, these languages, in particular, and the whole artificial intelligence field, in general, constitute "a window on the world" for data processing. In this perspective, the first version of Xlog, a Prolog interpreter, was created on the Micral 30. It is supposed to have the following characteristics: 280 lips (logical inference per second) on a PC or a compatible computer; an integrated environment with windows; various extensions, including tree tables, the possibility of typing variables and functional notation; dynamic memory management. New Prolog compilation techniques should result in an Xlog "interpretation and compilation" integrated environment;
- efficient inference mechanisms: Bull is said to have created an inference mechanism prototype called Boum, operating in forward chaining in predicate logic. It is characterized by a group of techniques for compiling production rules in relational operations, with possible indexing. Boum is supposed to have already provided the support for several expert system prototypes created within the framework of training programs based on actual problems.

This is, then, the outline of the research undertaken by the Bull group in the field that is customarily called artificial intelligence. These tools are related to "knowledge manipulation", to use the current vocabulary. Which products will be marketed? Have a little patience, the answer to this question will be given next month.

The Bull group is also interested in machine architecture. In this field, it has taken two main directions. One of them is scientific supercomputers. In this report, you can read about the developments concerning the Isis supercomputer.

Schuss, a Processor for Sequential Files That Filters Data "On the Wing"

The second type of architecture being studied at Bull includes the creation of machines dedicated to database handling and to artificial intelligence language. Regarding the database, the model of a processor for filtering data "on the wing", a French specialty, has reputedly been in operation since the end of 1984. Schuss, as it is called, consists of a high-speed diskette controller and an associative processing operator.

Schuss is meant to handle searches in sequential files at a continuous rate of 300,000 characters per second. More complex operations (semi-joining, joining of relational algebra) should also be carried out. Let us remember that the five basic operations that allow to establish relations in a rational DBMS [database management system] are: merging, difference, joining, restriction and projection (or attribute selection).

To achieve the maximum performance of the logic-based programming languages that we mentioned above (Boum, Xlog) and of the Schuss DBMS, the Bull group has initiated the VLSI [Very Large Scale Integration] Micro-Schuss processor project; the architecture of this processor is specially adapted to these operations. Finally, let us mention the existence of the Multischuss project; this is a machine integrating a group of interconnected Schuss-type processors. The Multischuss software should be used for relational operations as well as for operations aimed at handling deductive databases. The Multischuss project developed within the framework of the "non-Von Neumann" Esprit project. In addition, Schuss prototypes would be assigned to INRIA, IRISA [Research Institute for Data Processing and Statistical Systems] and to GIA [not further identified] for experimentation.

The French manufacturer's Tiger project does not refer at all to this powerful wild animal but to "Traitement d'Informations Generalisees Et Reparties" [processing of generalized and distributed information]. Tiger, therefore, a project carried out jointly in Grenoble by an Imag laboratory (LGI) [Computer Engineering Laboratory] and the Bull research center, revolves around the following main points:

- an archival center allowing to manipulate generalized data using the Microbe relational DBMS;
- a document analyzer: Diva, an initial version of a document analyzer prototype, has supposedly been created. Diva allows digitalizing documents on a VIP 2000. Their processing takes place on a Mini 6;
- communication procedures: within the framework of the Rose project of the Esprit program, Bull has participated in the efforts to integrate the UNIX system and the ISO [International Standards Organization] protocols. These activities, particularly the creation of the X25 driver and the adaptation of the "transport" level, should result in the definition of a communication architecture and of communication protocols between work stations and archival centers.

The Tiger project, partly financed by ADI [Association for the Development of DATA Processing], is the subject of a close cooperation with the Grenoble LGI, but also with INRIA and CNET [National Center for Telecommunications Studies] on the definition of "man-machine" interfaces and distributed architectures.

This review of the research undertaken by the Bull group would be incomplete if it did not mention the work being carried out in the field of VLSI. Bull is indeed participating in the Sycomore national project, in cooperation with Thomson, INRIA and INPG [not further identified], on the creation of a system for the computer-aided design of third generation VLSI.

Finally, in utmost secrecy, the Bull group is carrying out all by itself a large-scale VLSI project. It is supposed to concern the incorporation of a whole DPS 7 computer on a single chip.

12260/13068

CSO: 3698/437

JPRS-EST-86-008
18 June 1986

WEST EUROPE/COMPUTERS

FRENCH R&D FINANCING STRUCTURES: ELECTRONICS, COMPUTERS

Paris ZERO UN INFORMATIQUE in French 17 Mar 86 pp 62-63

[Article by Philippe Moins: "Financing - The Budget of Research"; first paragraph is introduction]

[Text] After a golden age under De Gaulle and a decline in the seventies, research policy has been getting its second wind since 1981. Although computer science research is benefiting from the "electronics network" effect, nevertheless has it got enough money at its disposal?

Can do better... In the report that they gave to Hubert Curien in February, the OECD experts did not award the first prize to France. Admittedly, it comes in second place for its financial outlay per capita for research. But it ranks only fifth if this outlay is compared to the gross national product (GNP). The French ratio of 2.2 percent is indeed lower than the ratios published in England, in Germany, in Japan and above all in the United States (2.7 percent).

Moreover, this ratio has not reached the objective that had been set for it by the guidance and programming law of July 1982, indicating that it should be raised to 2.5 percent in 1985. "On several occasions since 1958, the officials in charge of scientific matters have declared that the expansion of the public outlay for technological research and development should reach that percentage. It has never been reached", Jean-Jacques Salomon commented in a report presented to Laurent Fabius, then minister of industry.

This is however a long way from saying that no progress has been made. Do people know that the national expenditures for R&D amounted only to 1.8 percent of the GNP in 1980? Do people also know that the average annual increase in the amount of the national expenditure for R&D was 2.8 percent between 1968 and 1980, and that it has gone up to 4.5 percent per year since 1981?

"France's ambition is to bring the overall financial outlay for research to 3 percent of the GNP around 1990", Hubert Curien even said in February. If there is any progress, it is not, however, achieved fast enough. But public authorities should not be the only ones to shoulder the responsibility for a situation in which industrials are far from being above reproach.

France, indeed, falls short in having too low a level of industrial research, in its financing as well as in the implementation of this research. For example, the proportion of research carried out by private companies is at the moment 57 percent in France, whereas it is 70 percent in FRG, 72 percent in the United States and 62 percent in Japan. And the disparity is even greater in terms of financing in which the public outlay reaches 57 percent and that of private companies only 43 percent.

"Not enough!" both the French government and OECD agree in saying this. Consequently, to encourage industrials to increase their share in the financing of national expenditures for research, the authorities have just devised a fiscal measure to delight the most reluctant people: the research tax credit is doubled and its rate is raised to 50 percent.

"In 1986", reads the chapter devoted to the objectives of the bill, "more than Fr 1 billion of fiscal expenses will thus be devoted to private companies." Some additional general figures on research in France allow it to be stated more accurately. The state devotes to it a total of FR 75 billion, one-third of it for military research and two-thirds for civilian research.

In a nutshell, the funds assigned to civilian research are in turn broken down into various sectors. These are: "mobilizing programs (at the 25 percent level), followed by fundamental research (23 percent), the technological development program (21 percent), applied and implemented research (13 percent) and also the La Villette Museum (3.5 percent) which has not collected less than Fr 1 billion every year since 1983.

Although it is possible to comprehend French research from the standpoint of the large sectors that constitute it, things get more complicated when we try to focus on one particular sector, for example data processing. This is because there are many public sources of funds, from the Ministry of PTT who supervises the computer industry to the Ministry of Research, including Industrial Reorganization and Foreign Trade which is itself the head of DIELI [Directorate of Electronic Industries and Data Processing].

This is a true imbroglio worthy of the French administrative oddities. Under these conditions, it is difficult to disentangle a skein in which are intertwined the interventions of the various ministries and those of public organizations such as CNRS [National Center for National Research], INRIA [National Research Institute for Data Processing and Automation] or the Data-Processing Agency, which are other important participants in the financing of computer research.

In the Administrative Tangle, from Supervision to Right of Observation, Who, Finally, Makes the Decision of the Budget?

Fortunately a recent report on DIELI's activities in 1985 has permitted evaluation of the situation and the realization that in spite of average results the government has given more support each year to what is conventionally called the network. The network concept originated in Abel

Farnoux' report, in which he advocated taking a number of incentive actions for electronics.

As the minister of industry, Jean-Pierre Chevenement launched this project in 1982, under the title of "mobilizing program for the electronics network". What assessment of this action can we make today? First, we are forced to observe that it did not reach its objectives, neither for production, since the network did not achieve the 9 percent annual growth that it had set for itself, nor for creating new jobs.

There is however one positive aspect: the trade balance deficit has been reduced...even though it still amounts to approximately Fr 8 billion. Is it negligence on the part of the authorities? Apparently not. On the contrary, subsidies to research and development for both electronics and data processing (excluding capital endowments to nationalized companies) amounted to FR 8.9 billion in 1985 (versus 7.8 billion in 1984), very appreciably more than the 5 billion paid out in 1981 and 1982.

Officially, this figure includes only subsidies to industrials for pre-competition research. It also does not include the financing of public laboratories or of military laboratories.

Actually, it is difficult to determine how much goes to basic research and how much to development. It is most likely that the largest slice of the pie goes to applied research, (in other words, to development), ahead of pre-competition research, itself far ahead of fundamental research. Furthermore, the FR 8.9 billion for the electronics network are mostly benefiting companies in the nationalized sector (Thompson, Bull, Matra and CGE)...who on top of that are the recipients of Fr 2.75 billion as capital endowments.

According to Jean-Pierre Verjus, the director of the Rennes IRISA, the annual cost of public research on data processing and automation can be estimated at a minimum of FR 1 billion. This cost is divided among INRIA (Fr 250 million), CNRS, the Ministry of National Education (Fr 450 million) and a few other organizations such as CNET [National Center of Telecommunications Studies], ONERA [National Office for Aerospace Studies and Research] or AEC. As for the companies of the electronics network, they are said to devote approximately Fr 2 billion to research. But this is a figure that includes both electronics and data processing.

At the Ministry of Research and Technology, Philippe Guerit holds the post of director of the mobilizing program for the electronics network. "The mobilizing program was instituted, on one hand to stimulate electronics and data processing research, and on the other hand to insure a better transfer of technology to industry. We are acting by means of incentive funds", he explains before pointing out that the funds thus distributed are not used to operate laboratories but to stimulate certain fields.

Money from the Ministry Is an Additional Budget for Labs That Already Have Their Own Funds

The Fr 200 million that he manages as the mobilizing program budget do not therefore constitute the whole funding for electronics research. Let us repeat, these are additional funds that are tacked on to the money that is already available to the laboratories for their operation. Nevertheless, they play an essential part, since their attribution gives an exact idea of which fields the government considers to have top priority.

These funds are dived up as follows: Fr 80 million for electronics, Fr 80 million for so-called "national" projects, and Fr 40 million for coordinated research programs", two key concepts of the mobilizing program.

In the national projects, industrials have the key responsibility with a financial participation of 60 percent on the average, the rest being provided by the government. These projects are supposed to result either in directly marketable products (first degree projects) or in a core of findings that may serve as a base for further development (second degree projects).

- The best known of these industrial-type projects is called Emerald. "This national project of software engineering is now reaching...[one line missing] will be marketed next September", says Philippe Guerit, who adds proudly: "This is a success." The product (installations for software engineering workshops) is now attracting the attention of the British. "Besides, the Emerald GIE [Economic Interest Group] is participating in PCTE within the framework of Esprit, and there will also be extensions within the framework of Eureka." The Emerald GIE brings together Bull, Eurosoft and Syseca.

- We will still have to wait for a while (probably 1 and 1/2 year) for the SM-90 project (a multiprocessor machine designed by CNET) to take shape. The Public Interest Group for Science and Data Processing (Gipsi) that has been organized around this project, initially developed by CNET, involves INRIA, CNET and Bull.

- A national project for display systems, conducted by CSEE is currently in progress. Its goal is to design a CAD/CAM [computer-aided design and manufacture] station based on an SM-90 architecture.

- Also in progress, the Ministry of Defense project for scientific supercomputers, known as Isis, aims at developing a 200 Mflop machine. Bull and Sintra are participating in it.

- The Acacia project (CAD/CAM again) also involves Bull, as well as Informatique Internationale, a company from the Cisi group.

- As for Sycomore, it involves jointly Bull, Thomson, INRIA, INPG in a CAD project in VLSI [very large scale integration].

- Finally, Thomson is involved in an electronics project for the general public.

Mum is the word regarding the size of the budgets that support each of these various national projects: the figures are not available, we are told at the Ministry of Research, because they all involve industrials. Parallel to these projects, the Ministry of Research and Technology has established coordinated-research programs--or PRC--from coordinated-research groups (Greco) created by CNRS.

It does not matter whether they are called Greco or PRC: in any event, their point of view differs from that of national projects in the sense that in this case they handle only fundamental research. Four of these PRC's were launched in 1984; the other three started up last year. They will account for a Fr 40 million budget in 1986 versus Fr 31 million in 1984. These amounts must be understood as incentive funds that do not therefore represent the total financing of these PRC's.

"Actually," Philippe Guerit explains, "there is a unifying concept behind these programs, and that is artificial intelligence. It is rather as if we had cut one single large program into several slices." Last January, a PRC seminar provided an opportunity to assess the progress of the various programs:

- "Man-machine communication" PRC (manager: Jean-Paul Haton, CRIN). Research is carried out on natural language and speech processing, and also on computer-aided vision. Approximately 100 persons belonging to 17 laboratories are working on projects supported by this program.
- "Linguistics and Data Processing" PRC (manager: Maurice Gross, Paris VII). Approximately 30 researchers are participating in it.
- "Advanced programming and tools for artificial intelligence" PRC (managers: R. Cori and G. Cousineau). Approximately 30 laboratories are working on it.
- "Artificial intelligence" PRC (J.C.Latombe and H. Farreny). It involves jointly 90 researchers belonging to 17 university teams or teams associated with CNRS.
- "Advanced databases" PRC (G. Gardarin and M. Scholl). Managed by INRIA, it carries out research along four main lines: multimedia databases, deductive databases, database interfaces and architecture/evaluation. Approximately 20 laboratories are participating in it.
- "C³" (read C cube, for Competition-Communication-Cooperation) PRC. Managers: J.P. Verjus and P. Quinton. Centered around architecture, it involves more than 50 teams. "The necessity of having the right objective in the areas of architecture and systems", "keeping in touch with CNET who has indicated its intention to handle again the systems activities and to initiate a cooperation between IRISA and Bull": these were the two guiding principles adopted at the end of the PRC seminar.
- "Mathematics and data processing" PRC (manager: D. Perrin). Almost 200 researchers are involved jointly in approximately 20 projects.

- "Architecture is one field handled in C³," Philippe Guerit points out, "but it could be the subject of a program all by itself. Something should be set up during this year, either a strengthening of C³ or a new full-fledged PRC. In any event, this will ultimately result in a national project."

Expansion on the Rise

To get some response from the industrial world concerning all the PRC's, the MRT [Ministry of Research and Technology] has decided to publish a small descriptive brochure that it will distribute simultaneously with a larger descriptive document (20 to 20 pages) for each of the programs. At the same time, a permanent secretariat of PRC's may be created in the form of an industrial club. It will be responsible, in particular, for organizing a symposium in 1986, to present the PRC's to industrials.

All these actions confirm that the worlds of research and industry are getting closer. It should be noted anyway that, with the exception of subsidies to Anvar, which have declined for the last 2 years, all the expansion indicators are rising. In 1985, the number of contracts signed between CNRS and companies rose 38 percent relatively to 1984 and almost quadrupled relatively to 1982.

In spite of this renewed R&D effort since 1981, some problems remain:

- there are 14 times more researchers in American industry than in our own, 5 and 1/2 times more in Japan, 2 and 1/2 times more in Great Britain and in FRG;
- national companies are receiving the major part of public funds earmarked for industrial research;
- fundamental research remains inadequate;
- data-processing laboratories do not have enough equipment (see CNRS article).

"All our successes are occurring in fields associated with governmental contracts," Jean-Jacques Salomon remarked in his report, "whereas American industry's performances are very far from being limited to the captive markets of the state."

[Boxed item]

Estimate of total number of researchers
(data processing - automation - signal - 1985)

<u>Organizations</u>	<u>Total Number</u>	<u>Data Processing</u>
Higher education and CNRS	2,000	1,200
INRIA	600	350
Order of magnitude for CNET and others	500	300
PARIS		
- Paris-Jussieu	-	300
(LITP, MASI, GR 22)		
- INRIA-Rocquencourt	380	200
- Paris-Sud (LRI - ISEM)	-	150
GRENOBLE		
Institut Imag (5 laboratories)	-	300
TOULOUSE		
(LAAS, LSI, CERFIA)	500	300
RENNES		
(IRISA = INRIA-Rennes Center		
+ lab. associated with CNRS	190	150
LANNION		
[last line missing]		
12260/13068		
CSO: 3698/437		

WEST EUROPE/COMPUTERS

BULL'S ISIS SUPERCOMPUTER IN FINAL CONSTRUCTION STAGE

Paris ZERO UN INFORMATIQUE in French 17 Mar 86 pp 74-76

[Article by P.L.: "Supercomputers -- Vector-Type or Parallel?"] first paragraph is introduction]

[Text] Two strategies are competing to create powerful computing machines. The first one consists in building Cray-style vector supercomputers. The second one, less hungry for money, makes a massive use of parallelism.

Should we build large computers or should we merely buy American or Japanese ones? Or, to put it in other words, should we invest hundreds of millions of French francs in big megaflop eaters that in the end have an extremely limited market? The answer to these questions goes far beyond scientific interest and entails political as well as military considerations.

Great Britain, for one, has quite simply given up building its large scientific computer. After taking into account the investments required for designing a Cray-type machine and the size of the market for these machines --less than 200 Crays in the world--the British turned to solutions that eat up much less research money but may still prove just as effective: among others, the developing of machines having a high degree of parallelism, built from extremely powerful basic blocks. All the projects that include the Inmos Transputer fit this characteristic, as we shall see later.

This "money-saving" attitude of the British is also that of French academics and, in general, of all research institutes that have limited financial means. On the other hand, those who have the means of financing heavy research programs, most often military defense organizations, want to have their own large "Cray-type" computers.

This is indeed what is happening in France with the projects of the Directorate of Armament Research, Design and Technology (DRET). Is the project of building French supercomputers the response to a desire of independence regarding the National Defense computing needs, or is it simply intended to prove that we can do as well as the Americans?

At any rate, DRET gave the kickoff to the building of the French supercomputer in 1981. An extendible project that was to produce a whole series

of spectacularly performing machines. At that time, a think tank headed by Professor Lions established the following specification objectives: the processing power of the machine under consideration should be higher than 200 Mflops (millions of floating-point operations per second). The size of the memory should be close to one Gb (gigabyte or billion of 8-bit bytes).

Furthermore, the users should be able to use Fortran programs in the super-computer and should have parallel process management programs. Officially, these specifications should have resulted in the start-up of three research programs, summarized as follows in official documents:

- "Design and development of a powerful basic machine (minimum 50 Mflops per second)": this is the Isis subprogram, assigned to Bull, resulting in the creation of two prototypes in 1986;
- "Architecture studies assigned to Sintra in association with ONERA [National Office for Aerospace Studies and Research], CERT [Center for Technological Studies and Research], Nice University (LASSY) and IRISA [Research Institute for Data Processing and Statistical Systems] (a research center used jointly by Rennes University and INRIA [National Research Institute for Data Processing and Automation]): this is the Marianne subprogram. It plans on the creation of two demonstration systems: a multiprocessor system encompassing up to eight machines working in the asynchronous mode and a system of synchronous parallel processors. Each of these systems will be built in 1986 by assembling microprocessors;
- "Creation and development of a very powerful machine by integrating Isis basic machines into a Marianne-type multiprocessor system, with a 1988 target date": this is the Marisis subprogram.

This is how the French supercomputer project was described 5 years ago. The cost of the operation was estimated to be close to Fr 800 million. At the beginning of 1985, the Ministry of Defense had already invested close to Fr 300 million in this project. The other partners had only thrown a very small contribution into the pot of this technological Marianne: Fr 30 million for DGT [General Directorate of Telecommunications], Fr 13 million for DIELI [Directorate of Electronic Industries and Data Processing] and Fr 10 million for MRT [Ministry of Research and Technology].

Today, there are only a few months left to the researchers to put the last touch to the prototypes that they promised to DRET. What if these prototypes did not actually exist? There is no doubt about Isis. But, in our opinion, it is not absolutely certain that Marianne and Marisis will come into being in a near or even a far future.

The Isis computer is taking shape on the Bull premises in Cluses-sous-Bois. "Isis has been in the construction stage for one year," we were told recently by Claude Timsit, the director of Bull's high-performance systems. "The first prototype will be in operation by the end of this year, and the integration of the software will be finished in mid 1987." A touch of pride can be detected in this young Supelec [Advanced Electrical Engineering

School] engineer, hired by Bull to face the challenge of the French super-computer, when he adds: "This is the first time that we are building this type of machine in France."

Isis, The One-Gigaflop French Computer, Will Be Operational in 1987

What is this type of machine? Isis' architecture is built around four elements:

- a central memory M1 that contains code and data;
- a central unit consisting of four independent scalar execution streams sharing one vector unit;
- a large-size secondary memory M2: 512 megabytes at the present time, with a projected extension to 2 gigabytes. Actually, M2 acts as input/output storage;
- an input/output controller, to which the various Isis peripherals are connected: high-speed mass memory (M3) and Network Systems Corp.'s Hyper-channel adapters. These are the same types of channels that are used by Cray-2 to communicate with the outside.

Isis' central unit consists of four independent, identical scalar streams and one vector unit. The function of the streams is to search for programs or tasks that are in the memory, to carry out scalar instructions and to subprocess instructions to the vector unit. The central unit can therefore carry out four tasks at the same time.

Each of the streams has its own floating point or integer arithmetic units, 256 general registers with triple, simultaneous access and a storage memory for 256 instructions that allows an automatic anticipation of instruction loading and prepares branchings. In view of the small range of instructions (no more than approximately 50 instructions) and the large number of registers in the scalar unit, the latter may be considered as having a RISC (Reduced Instruction Set Computer) architecture.

As for Isis' vector unit, depending on its configurations, it consists of 8, 16 or 32 basic processors operating simultaneously. Each processor handles 64-bit bytes and carries out floating-point or integer arithmetic operations at the rate of one simple operation every 30 ns (billionth of a second).

According to Claude Timsit, Isis should reach a peak speed of one Gflop (one billion operations per second). The sustained speed, for example on Fourier transforms, should be between 700 and 800 Mflops. The DRET specifications are largely exceeded! Furthermore, the Bull development team is planning to provide Isis with a Fortran compiler that would accept vector types, as well as with a system allowing to convert the Fortran 77 to the vector mode. Finally, a scalar and vector macroassembler should be available.

"Many software programs are already working and are being optimized", the Bull people say.

Although it is difficult at the moment to assess the progress of the applications software for the Isis machine, it is possible to see with our own eyes the progress of the hardware by walking through the Bull premises at Clayes-sous-Bois. Several cabinets overflowing with colored wires contain the M1 memory. This memory is entering the final test stage.

DRET came recently to check that the memory cycle time does conform to the 60 ns specifications. Apparently, the test proved conclusive and the military left satisfied. On the other hand, the rest of the machine is still at the assembling stage.

Technicians, equipped with patience and oscilloscopes, are checking the boards. One by one, the circuits--prediffused ones, with 2200 gates, from Siemens, for the computing units, and chips from Immos for the memories--are tested, connection after connection, according to the diagrams. Everything has been strictly prepared with the same automated design systems that were used for creating the DPS 7.

Finally, a specially equipped computer room, noticeably empty for the time being, is waiting for the arrival of Isis, who could well be the only French supercomputer. Although Claude Timsit hopes that his computer will have big brothers, he cannot say for sure that they will be 100 percent French: "As far as we are concerned, Isis does not constitute only one computer. The instruction code allows to expand it into larger models. We want to start a project with Siemens to build a computer a size larger than Isis, whose performance would be between 10 and 30 Gflops. This project would receive support from DGT, DRET and MRT. But we are also looking for other financing possibilities, for example within the framework of Eureka."

This is a hard blow to national pride: beautiful Marianne [also a symbol of the French Republic] could well be in danger of becoming... Marieke. However, we can only rejoice at this fine example of European cooperation. Still, the French supercomputer venture clearly shows that the development of such machines cannot be considered any more within the scope of only one European nation: the investments that have to be committed are too heavy. Sometimes, one wonders where Seymour Cray's subsidies are coming from...

What causes such large research costs? In the case of Isis, for example, it was necessary to design circuits, to have them made in a rapidly changing technology, to assemble them on the boards, to test these boards, etc. Specialists have been working on it for years. But on the other hand, this is the surest way to build in the end a coherent machine with appropriate development equipment, since all the components of the final system are designed according to a common guiding principle.

Assuming that one manages to collect the funds necessary to its construction, such a machine does not amount to what is called a "Crayette": it is a true supercomputer. In the researchers' jargon, the slightly contemptuous name of "Crayette" refers to a small machine full of parallel

microprocessors that has no specific development equipment and requires very specialized system programmers to make it work.

However, when one does not have the funds to develop a supercomputer, parallelism is an attractive alternative. By putting together already existing elements, microprocessors among others, it allows to design computers that have respectable performances. This is the point of view of the C3 (pronounced C cube) project started in France, in 1983, by CNRS [National Center for Scientific Research] and the Ministry of Research and Technology within the framework of coordinated research programs. C3 means: cooperation, competition, communication.

This project, under the direction of Jean-Pierre Verjus, the director of research at CNRS and the scientific director at IRISA in Rennes, has only limited funds, Fr 1 million in 1983, Fr 8 million the following 2 years and possibly Fr 10 million this year. This is far from the amounts considered by DRET--nearly Fr 800 million--for the development of Isis, Marianne and Marisis. Nevertheless, at the moment C3 brings together a group of nearly 300 researchers in 20 public laboratories.

A Local Network, Data Distribution Networks and Specialized Computers Will Constitute Tomorrow's Computing Center

C3's objective is to master parallel and distribution techniques. Why? According to Jean-Pierre Verjus, "appreciable speed increases will be achieved through the use of highly parallel and specialized architectures. Furthermore, the allocation and the division of the tasks of a group of users are achieved through linking relatively autonomous systems to networks. This produces weakly linked architectures or distributed systems. The development of parallel or distributed architectures or systems carries problems for which the designers have to invent, express, verify and test parallel or distributed algorithms."

This, of course, is the theory. In practice, what will tomorrow's computing center look like? Jean-Pierre Verjus' answer: "It will first consist of a local network to which will be connected powerful work stations (SM 90's, SUNs or Apollos), data distribution systems, specialized computers (vector or ultra-parallel) and interconnections that will allow to access far-removed software and hardware resources. The user at his terminal will express his needs as follows: I need a 2 megabyte data bank, in Grenoble for example, and a Cray 1. Starting from there, the network will have to find a way to allocate the requested resources."

This sounds like a dream! But let us come back to earth and let the director of the C3 project describe in detail the various kinds of work already started at the present time:

"In the area of networks and distributed systems, the choices have been made: the SM 90 as a basic computer and a hierarchy of networks: Sm bus--local network of the Ethernet-Transpac type. At the moment, five teams are conducting studies on system cores, on protocols for communication or long-distance calls, on languages adapted for allocation (INRIA, LAAS [Automation

and Systems Analysis Laboratory], LGI [Computer Engineering Laboratory], LSI [Computer Science Laboratory], MASI).

"In the area of parallel architectures, while waiting for a low-priced parallel computer in France that would allow the teams to handle experiments and then to do research, we have opted first for the development of a project well-adapted to our objectives and our financial means, within the framework of systolic architectures in which very imaginative studies on algorithms and on computer-aided designing of circuits are taking place (IRISA, ENST, CRIN, LCS, LGI, TIM). Limited studies on new architectures have been started at LRI [Computer Science Research Laboratory], at CERFIA and at LASSY.

"In the area of distributed and parallel algorithms, the objective is to regroup and coordinate the algorithm designers by offering them validating and evaluating tools (Atlas federating project developed at CNET [National Center for Telecommunications Studies]). The algorithms concerned are, on one hand, standard algorithms (digital, nondigital, systsem...) that must be redesigned, and on the other hand, those that must be invented to solve new specific problems, such as signing off, mutual suspicion... As far as evaluation is concerned, it is based mostly on simulation while waiting for new research conducted in this area to expand, or even redesign, the existing tools so that they take allocation and in particular time phenomena into account. In France, 25 teams are working as a group within this area of the C3 project; the main ones are at CRIM, CNET, IRISA and ISEM.

"In the language area, the objective is to study parallel or distributed programming languages, with a very rigorous semantic definition, and to develop them. Three main directions can be recognized in the work done in this area. First, the study of asynchronous languages in the ADA, CSP, Estelle family, LC3, and original language, and its compiler have been developed at IRISA and studies on OCCAM and advanced communication modes are being carried out in LGI and at CRIN, respectively. The second direction concerns the study of synchronous languages, aimed at programming systems that respond to external signals and send out signals or commands to their surroundings (systems that are often imprecisely called real-time systems). The languages developed in this area are Esterel (INRIA), Lustre (LGI) in connection with Signal (IRISA). The third direction concerns the study of parallel execution diagrams of practical languages such as FP (IRISA) or of one of its original parallel extensions, FP2 (LIFIA).

"In the semantics and testing area, the research concerns the study of models and the implementation of software allowing the construction of system models and the testing of certain characteristic properties of these systems. Parallelism models are built to indicate the performance of systems that may be designed to consist of independent logic or hardware units, subject to synchronization and communication constraints.

"The models may be broken down into two main types. The first ones are based on state and transition concepts. This first type is that of transition systems usually associated with various types of automata or machines, such as Petri nets of finite-state automaton networks (LRI, LASSY, MASI, LAAS)."

Whereas the C³ program is exclusively French, the Supernode project on the other hand will be carried out in cooperation with our neighbors across the Channel, since the European Community has just approved the building of a supercomputer that will involve French and British industrials and academics. Supernode, which should come into being in 1988, is provided with a Fr 70 million budget, 50 percent of which is financed by EEC.

On the English side, the research for Supernode will be carried out by RSRE (Royal Signals and Radar Establishment) as the supervisor, Thorn EMI, Inmos the Transputer manufacturer and Southampton University. On the French side, the Grenoble Computer Engineering Laboratory (LGI) will actively participate in the designing of the computer while Apsis will develop industrial applications using Supernode. Finally, Telmat should manufacture this European computer.

For Traian Muntean, a researcher at the Grenoble LGI, parallelism is the major challenge of the Supernode project. Indeed, the computer under consideration will be built from nodes, each one consisting of 16 Transputers, linked by a programmable interconnection network, with circuit switching. Altogether, Supernode will include several hundreds of Transputers operating simultaneously in a hypercube configuration. One problem to be solved, and not the least one, is to achieve the coordination of all the processings.

This task should be made easier by the nature of the Transputer's application language: OCCAM, since this language applies the principles of communication between sequential processes as defined by Tony Hoare in his CSP (Communicating Sequential Processes) model. As far as performance is concerned, Supernode should match that of a Cray at a price 10 times lower. A study is in progress to assess the size of the market that Supernode could capture as a result of its cost.

The Supernode project, therefore, is presenting another justification to the advocates of parallelism. In this area, there is no lack of projects in France as in other parts of the world. In the United States, the Connection Machine from Thinking Machines Corp. should include several thousands of parallel processors. At the moment, it is impossible to say for sure that a prototype is actually operating. This also applies to the Butterfly from Bolt Beranek Neuman. Would the practical application of parallelism reveal obstacles that theory does not suspect?

[Boxed item]

The 20 French Laboratories of the C³ Project

The C³ project (cooperation, competition and communication) was created through the merger of a CNRS coordinated research group (Greco) and a coordinated research program of the Ministry of Research and Technology. The objective of C³ is to succeed in creating parallel and distributed systems. At the moment, it consists of almost 300 researchers distributed among the following 20 laboratories:

- CNET: SLC/EVP, P.O. Box 40, 22301 Lannion Cedex.
Tel.: 96 38 36 65;
- IRISA: INRIA Rennes and UA, 227, Beaulieu campus, 35042 Rennes Cedex.
Tel.: 99 36 20 00;
- ISEM: Paris-Sud University, Building 490, 91405 Orsay.
Tel.: 69 41 66 30;
- LRI: UA 410, Paris-Sud University, Building 490, 81405 Orsay.
Tel.: 69 41 66 29;
- INRIA Rocquencourt: P.O. Box 105, 78153 Le Chesnay Cedex.
Tel.: 39 63 55 11;
- ENST: UA 820, 46 rue Barreau, 75634 Paris Cedex
Tel.: 45 81 77 38;
- MASI: UA 812, Pierre and Marie Curie University, 4 Place Jussieu, 75252
Paris Cedex 5. Tel.: 43 36 25 25;
- LITP: UA 248, Paris-VII University, 2 Place Jussieu, 75251 Paris Cedex
5. Tel.: 43 25 98 74;
- CRIN: UA 262, P.O. Box 29, 54506 Vandoeuvre-les-Nancy Cedex
Tel.: 83 28 93 93;
- Bordeaux University: UA 226, UER Math and Info, 351 cours de la Libera-
tion, 33405 Talence. Tel.: 56 80 84 50;
- LGI: UA 398, P.O. Box 68, 38402 Saint-Martin-d'Heres Cedex.
Tel.: 76 51 48 32;
- LIFIA: UA 394, P.O. Box 68, 38402 Saint-Martin-d'Heres Cedex.
Tel.: 76 51 46 18;
- TIM: UA 397, P.O. Box 68, 38402 Saint-Martin-d'Heres Cedex.
Tel.: 76 51 46 00;
- LCS: UA 395, INPG, 47 avenue F. Viallet, 38031 Grenoble Cedex.
Tel.: 76 51 46 00; [as published]
- LSI: UA 347, Paul Sabatier University, 118 route de Narbonne, 31062
Toulouse Cedex. Tel.: 61 55 66 11;
- LAAS: LP 8001, 7 avenue du Colonel Roche, 31077 Toulouse Cedex.
Tel.: 61 33 62 00;
- CERFIA: UA 824, Paul Sabatier, 50A chemin des maraichers, 31062 Toulouse
Cedex. Tel.: 61 55 66 11;
- CRIM: UA 815, Montpellier University, 860 rue de Saint-Priest, 34100
Montpellier. Tel.: 67 52 44 53;
- INRIA Sophia: Sophia Antipolis, 06565 Valbonne.
Tel.: 93 65 77 77;
- LASSY: UA 814, 41 Boulevard Napoleon III, 06041 Nice Cedex.
Tel.: 93 83 71 16.

12260/12948

CSO: 3698/436

WEST EUROPE/DEFENSE INDUSTRIES

DIEHL WEAPONS LAB WORKS ON SENSORS, LASERS, FLIGHT CONTROL

Bonn WEHRTECHNIK in German Apr 86 pp 103, 104

[Article by Wolfgang Flume: "The New Diehl Development Center"]

[Text] "Every step to shape the course of the future rests on the research of the present. And only by looking ahead can we deal with urgent current problems. Questions about the future are answered best by a 'forward strategy' and an awareness of our own abilities." It was along these lines that the Bavarian economics minister, Jaumann, welcomed the capital expenditures for futuristic projects by the firm of Diehl in Roethenbach near Nuernberg, on the occasion of the presentation of its new development center for the munitions division. In recent years a center with the most up-to-date lab and test facilities has been built there, for more than DM 35 million, with the intention--as the head of the munitions division, Herbert Kuphal, called it--"to increase the efficiency of our weapons systems through more accurate firing and a greater terminal effect, and through the development of cost-effective munitions."

The company had invited representatives from the public sphere, the armament sector, the armed forces, and defense research institutes to this presentation ceremony, but it had also invited its own workers, in order to thereby improve the often "by no means so easy process of learning about each other's work within the company and thus also to strengthen in-house understanding and motivation." As the representative of the government's armaments department, Subdivision Chief Dr Wolf Dietrich Meisel, commissary for defense research, expressed the ministry's satisfaction with such substantial in-house efforts by industry: "The realization that the importance of bulk-delivered munitions is gradually waning, and that the emphasis is shifting more and more to highly efficient munitions--often labeled as intelligent munitions--has induced you to see to it that the transfer of know-how from research and the most up-to-date technology can be managed by your own facilities. Your development center is the most recent sign of the linking of construction and the training of a highly qualified development team with adequate provisions in terms of equipment. Thus there is further progress in the way you have been expanding your traditional activities in weapons, munition-payload, and fuze technology to sensor technology, signal processing, materials engineering, flight control, flight mechanics, and even to laser technology."

The occasion for this presentation was the official opening of a new building complex for the development division, which previously had been working in scattered locations to some extent and which now has a gross multistory area of 6,000 m² for offices and 9,500 m² for laboratories and workshops. The emphases of the present and future activities of the roughly 450 employees working there will be:

- Warheads--that is, the "terminal effect" aspect, which will be allocated about 30 percent of these capital expenditures for development
- ballistics and sensor technology--that is, the "firing accuracy" aspect, with about 50 percent of the capital expenditures, and
- test and mensuration technology and simulation, with about 20 percent of the capital expenditures.

To dwell longer on some other figures: Of the development capacity in question, about 30 percent is being allotted to products that are to go into production in the next 3 years, 60 percent to products for the next 4 to 15 years, and 10 percent to projects of the future, for example new accelerator principles and corresponding high-velocity projectiles. Noteworthy is the increasing use of electronics in modern munitions--the proportional value for electronics in connection with intelligent munitions is likely to be around 50-70 percent. Here, Diehl is ready for close cooperation with electronics firms--there is no intention of stealing anything away from the electronics industry. On the contrary, the task of the munitions industry is said to be the intelligent application of electronics--that is, with respect to applications its specific-purpose conceiving, designing, integration, packaging, testing, and--to the extent that it is application-specific--also the software component.

The installations of the development center that were presented include the following, among others:

- the machine shop
- the test workshop, which can be traversed also with tracked vehicles
- the development departments for tube artillery technology and terminal ballistics
- the materials laboratory, designed especially for composite materials and crystal technology
- the holography laboratory
- the laser lab with a test track
- a triaxial revolving table with a 20-Mips real-time computation control system for "hardware in the loop" simulation (for example, simulation of the free flight of terminally guided sub-munitions)

- modern testing and measuring equipment
- a setup for manufacturability studies, for example for "Computer Integrated Manufacturing."

The separate work stations in the new building are connected with the computer center by way of a closed-loop circuit system.

These installations are to be supplemented further this year by

- an environmental test center with a rocker rig producing forces up to 80 kg
- a detonation chamber with a free-flight tunnel specifically designed for P [projectile-forming] charges, and
- another firing range at Grafenwoehr.

The significance of these industrial research and development facilities for our defense technology can be inferred also from the fact that in Germany knowledge and experience in these fields is restricted essentially to this industry, since--in contrast to other countries--we have only two or three research institutes that concern themselves with this particular subject, and universities are not doing so at all.

Of the many research and development activities of the Diehl firm demonstrated on this day to the attentive guests, in what follows let us describe a few of these:

- A laboratory model of a 30-mm gun for caseless ammunition. A rate of fire of 650 shots/min has been achieved. Over 70 shots were fired off without cook-off.
- A 30-mm liquid-propellant gun with a muzzle velocity of 1,050 m/s and a gas pressure of 2,430 bars. The performance of this weapon corresponds roughly to that of the 30-mm Mauser. In general, with the same maximum gas pressure higher kinetic energies at the muzzle can be achieved than with solid propellants.
- An automatically reloadable 120-mm self-propelled mortar with a rate of fire of six shots in 10 seconds.
- Projectile-forming charges for future artillery ammunition, in which the charge encasement is simultaneously also the antenna for millimetric-wave radar. It depends on the type of encasement whether a P-charge may also have a fragmentation effect.
- Cutting charges with performances higher by a factor of three than what they were just 5 years ago.

- Shaped charges with coherent jets (not a tandem arrangement): From the same charge, a sort of pre-jet for tripping active armoring mechanisms is followed by a second jet that penetrates the armor proper.
- A terminally guided artillery projectile EAP with a delta wing that can be extended at the maximum height of the flight path (rigid leading edge, the surface made of fabric) in order to achieve a range of over 30 km.
- An electromechanical control system for the guidance and stabilization of guided munitions such as COPPERHEAD or EAP. This three-plane control system is driven by direct-current motors, has an integrated servo electronics, and at present is launch-stable up to 10,000 g.
- A laser-beam control system with an accuracy of 1/1,000 mils, which can be used, for example, for a high-energy laser designed for air defense. To this end, a reflector is used that has a deformable surface (adaptive optics), by means of which the laser beam homes in on a moving target and atmospheric disturbances are compensated for.
- He-Ne laser tracking was shown on a demonstration model. In this case the laser spot remained "glued" to the same point on a model airplane even when the model made circular motions within a very large angular range.
- A functional model of an infrared sensor for a future anti-helicopter missile.
- A modular, universally usable pulse-code-modulation telemetry system with a maximum of 32 channels, a resolution of 10 bits, and a transmission rate of 1.28 Mbits/s for accelerations up to 20,000 g. It is used for the transmission of measured values and the checking of the functioning of fuze settings from projectiles in flight.
- Tubes of high strength and rigidity but of low weight, made from fiber composite materials. These high-pressure tubes are suitable for panzerfausts, but can also be used for test purposes in connection with automatic weapons, permitting in such cases the visualization by means of X-ray flash technology of inner-ballistic processes such as ignition and burn. These fiber composite materials also find application in connection with RAM launchers. Also, by using this technology compressed-gas cylinders can now be manufactured that formerly had to have an aluminum casing on the inside, since fiber composite material is not absolutely gas-tight.

12114

CSO: 3698/0415

18 June 1986

WEST EUROPE/DEFENSE INDUSTRIES

PROPERTIES, APPLICATIONS, FUTURE OF EUROPEAN GYRO SENSORS

Bonn WEHRTECHNIK in German Apr 86 pp 62, 65-66

[Report by Werner Hansli: "Modern Gyro Sensors for Strapdown Applications"]

[Excerpts] The mechanical gyroscope has been used since the time of World War I as a sensor for measuring angular velocities for purposes of navigation and flight control. The characteristic configuration was the fixed-in-space--that is, the cardan--mount. With the appearance of the microprocessor, it is now possible to mount gyro devices fixed to the airframe--in strapdown fashion. In the following report, Graduate Engineer Werner Hansli of Honeywell discusses various gyro types as well as their specific suitability and areas of application. He also touches on future prospects.

Performance Data and Areas of Application

Dynamically tuned gyros (DTG) have been produced in Germany for about 6 years now: At the firm of LITEF, the type K273 developed there is being made, while at BGT (Lake Constance Equipment Engineering, GmbH), a gyro of the firm of Singer Kearfott is being manufactured under license.

The measuring ranges of these dynamically tuned gyros cover the entire range up to 1,200 degrees/second, but for physical reasons the requirements for a large range of applied rotational speeds and a great stability for the zero point are competing goals, as can be seen in Table 1. In addition, the g -dependent and g^2 -dependent drifts must be taken into consideration in accordance with the intended application.

In summary one can say that in the relatively near future, it is ring laser gyros that will be used as strapdown sensors because of their good performance data, their general applicability (regardless of acceleration and vibration requirements), their small overall costs during use, and their not yet fully utilized developmental potential. The fiber gyros still need a considerably longer time for development, whereupon they will probably be capable of being used as low-cost sensors of intermediate quality.

The dynamically tuned gyros will lose in importance because of the substantial requirements placed on strapdown sensors, for example in connection with military applications, but in the area of highly accurate platform systems they will continue in use. Their very small size must also be judged to be a decidedly positive factor.

Glass-fiber and PARR [passive ring resonator] sensors are still in the testing stage, and although all optical gyros theoretically have the same lower threshold of physical sensitivity, the actually realized measuring accuracies of the fiber and PARR sensors are worse than those of the laser gyro by almost two orders of magnitude.

A hitherto unsolved problem is the practically feasible reducing of the large disturbance penetration factor. In contrast to the case with the laser gyro, here it has not yet proved possible to develop any effective compensation method for the perturbing influences. A breakthrough in the direction of improved measuring accuracy is not in sight at present. Such a development will lead to reliable low-cost sensors for flight and vessel control as well as for short-term navigation.

The hitherto published performance data clearly show drift values between 1 degree/hour and 10 degrees/hour.

The drift values achieved at present for PARR sensors amount to 10-50 degrees/hour.

Of the optical gyros, so far it has proved possible to develop only the laser gyro into a highly accurate and reliably measuring sensor comparable in measuring range and accuracy to the expensive precision-mechanical gyros. But it has additional advantages over these:

As can be seen in Table 2, the ring laser gyros have drift values around 0.01 degrees/hour, with this being true under varying environmental conditions, not merely under laboratory conditions.

Other advantages are:

- a long service life and great reliability because of the absence of working parts;
- a large dynamic range;
- immediate readiness for operation;
- stability against vibrations and accelerations;
- a large range of rotational speeds with an extremely linear measuring sensitivity and a high resolution;
- the maximum applied speed is determined by the design of the sensor electronics; the other parameters such as the measuring sensitivity, aberrations from linearity, and drift remain unaffected by this.

Some of the ring laser gyros shown in Table 2 are being manufactured already in large numbers for commercial and military applications, such as the Honeywell GG 1342 in the United States, with about 200-250 of such items per month being produced for the inertial navigation systems of the commercial aircraft Boeing 757 and 767, Airbus A-310 and 320, and also for some military projects. This type of gyro has also been selected for the F-4 PHANTOM combat effectiveness upgrading program of the Bundeswehr, and will be manufactured under license from 1988 on at the Honeywell AG plant.

At the same time, other German firms as well are active in the field of the development of optical sensors. We could mention the firms SEL and Teldix in connection with fiber gyros. The firm BGT is working on passive ring resonators together with the Fraunhofer Institute of Freiburg. Considerable know-how in the area of optical gyros has also been amassed at DFVLR in Braunschweig. Recently, development work on ring laser gyros for ship navigation was begun at the firm LITEF.

Last summer, the firm of Honeywell AG of Germany, in cooperation with the firm of Carl Zeiss, was able to commit to testing the first prototype of a ring laser gyro from the IABG developed on behalf of the Federal Office for Defense Technology and Procurement.

Table 1: Performance Data for Some Dynamically Tuned Gyros

	Ferranti Oscillogyro Type 142	Incosym Incoflex DTG No. 7	LITEF K 273	Litton G-6	Sagem GSD	Singer Kearfott Conex	Singer Kearfott Gyroflex	Teledyne SDG-5
Weight (g)	227	100	250	400	130	140	275	<1045
Diameter (mm)	42.6	25.4	38	46	40	37	54	76
Length (mm)	44.1	38.1	49	38	34	45	46	76
Spin frequency (Hz)	175	160	180	100	180	200	240	100
Angular momentum vector H (gcm ² /s)	1.3·10 ⁴		2.8·10 ⁴	8.1·10 ⁴	1.4·10 ⁴	2.7·10 ⁴	1.8·10 ⁵	1·10 ⁶
Moment of inertia (gcm ²)			25	129		22	119	1800
- Spin axis			23			12	62	
- Transverse axis	18		200	550		45	440	300
Figure of merit								
Max. applied rotational rate (°/h)	0.28	1200	200 (400)	40 (200)	300	200 (400)	7.0	400
Torquer sensitivity (°/h/mA)	1.8 /h/V ¹¹	3600	1100	1250		900	48 (125)	170
- Linearity (ppm)	30	100		50	500	100	10	25
- Stability (ppm)				20		50	20	27
g-independent drift (°/h)	<0.5	<10	<25	0.005	5 (±0.05)	5.0	1.0	<2.0
Day-to-day drift (°/h)	0.01 (0.005)	1.0	0.3	0.01	<0.05	0.03	0.003	0.005
g-dependent drift (°/h/g)	<2.0	<1.0	<25 (±0.3)	5	2 (±0.03)	5.0	1.0	<0.2
g ² -dependent drift (°/h/g ²)	<0.06	0.10	0.15	0.02	0.2 (±0.03)	0.03	0.001	<0.03
Short-term drift (°/h)	0.005	1.0	0.3	0.002	<0.01	0.003	0.0003	0.001
Temperature range (°C)	-40 to +80	-40 to 90	-40 to 90	-40 to 80		-40 to 93	-40 to 71	-40 to 93
Vibration (g)	30 (10 to 1000 Hz)	30 (5 to 2000 Hz)	10 (5 to 2000 Hz)	10 (10 to 1000 Hz)		200 (10 to 1600 Hz)	100 (10 to 1000 Hz)	100 (10 to 1000 Hz)
Shock (g)	60 (11 ms)	250 (6 ms)	30 (100. 2 ms)	100 (0.5 ms)		225 (1.5 ms)	100 (11 ms)	150 (7.5 ms)
Linear acceleration	20		<20	50		225	225 (6 ms)	200
No. of mountings	0 ²¹	1	1	1	1	1	2	3

1) of the capacitive torquer

2) bar-shaped rotor with elastic
mount in 1 degree of freedom

Table 2: Performance Data for Some Ring Laser Gyros

	Honeywell GG-1342	Rockwell -	Litton LG-2717	Litton LG-2728	Sperry SLIC-7 (3axes)	Sperry SLG-15	Raytheon RB-25
Resonator length	32	43	17	28	20	40	25
Weight	1.9	3.63	1.5	1.5	2.3	7.2	-
Dimensions	15.7x14.7x5.3	22.9x22.9x7.6	14x11x6.5	14x17.7x6	10.2x11.4	10.2x20.3x27.9	-
Material	CERVIT	CERVIT	ZERODUR	ZERODUR	CERVIT	CERVIT	CERVIT
Lock-in compensation	mag.	dither	dither	dither	mag.	mirror	Faraday cell, 4 frequencies
No. of mirrors	3	3	4	4	3x3	3	4
No. of anodes/cathodes	2/1	1/2	2/1	2/1	2/1	2/1	-
Power consumption	< 1.6 Watt	28Vdc/0.6A	3 Watt	3 Watt	0.6x3Watt	0.6 Watt	-
Measuring range	800	-	800	400	1500	750	-
Bias stab. (1-10 h)	0.007	0.01	0.02	0.005	0.2	0.02	0.005
Bias stab. (d-to-d)	0.01	0.02	0.04	0.01	0.5	0.05	-
Random walk	0.003	0.005	0.015	0.003	0.05	0.006	0.001
Measuring sensitivity	2.0	1.57	3.0	1.8	3.2	1.6	1.5
Linearity	5	10	5	3	200	100	5
Stability	5	-	5	5	200	100	-
Temp. sensitivity	0.002	0.02	-	-	0.008	0.002	0.0004
Eff. of the bias	-	-	-	-	-	-	-

WEST EUROPE/MICROELECTRONICS

BRIEFS

FRG MEGABIT RESEARCH FUNDING--Pending a decision by an international group of experts due by the end of the month [April 1986], the subsidy promised to Siemens and Philips (the second installment of which is currently due) has been suspended. At the end of 1985, the German and Netherlands governments agreed to contribute to the development of a 4-megabit memory for up to DM 480 million (more than Fr 1,500 million). The FRG allocated DM 243 million (about Fr 775 million) for Siemens and DM 77 million (some Fr 245 million) for Valvo, a Philips subsidiary. [Text] [Paris ZERO UN INFORMATIQUE in French 28 Apr 86 p 7] 25004/12858

CSO: 3698/A137

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

CSELT UNDERTAKES ESPRIT, RACE PROJECTS, LOCAL R&D EFFORTS

Turin MEDIA DUEMILA in Italian, Mar 86 p 136

[Article: "ESPRIT and RACE, Start To Seven Projects;" passages in quotation marks published in English]

[Text] A subcontract has been drawn up between the Department of Computer Science of the University of Pisa and CSELT [Research Center For Computers and Telecommunications] under the auspices of the ESPRIT project. "Parallel architectures and languages for AIP--a VLSI directed approach," whose principal aims are the integration of logical and functional programming both in the definition and execution stage; the syntactical-semantic definition of a language which integrates both styles; and the definition of an abstract machine, based upon communicating converging processes.

-- The European Community Commission has approved six projects within the definition phase of the RACE program, in which CSELT is taking part with other partners:

"-- Development of a European IBC reference model for the terminal environment;

"-- Customer access connection;

"-- IVICO - Integrated Video Codec;

"Evaluation of switching techniques and technologies for the IBC;

"High bit rate long haul optical communications in middle infrared;

"SPECS - Specification environment for communication software.

--CSELT and the seminar of linguistics and didactics of the Languages Department of the University in Venice agreed upon a convention for research on a morphosyntactic analyzer to be used as an interface in natural language.

-- Franco Mannucci, CSELT research director for artificial intelligence, was appointed coordinator of GLIA, the work group on artificial intelligence of AICA, the Italian Association for Computer Science and automatic computing, which is based in Milan. The more than 2000 members of AICA are experts in

computer sciences operating in academic and industrial fields. The GLIA consists of a group of specialists in the specific field of artificial intelligence. Next spring the GLIA will organize a national meeting in order to develop a cooperative relationship with ECAI, the "European Conference on Artificial Intelligence;" AAI, the "American Association of Artificial Intelligence;" with world famous associations such as IFIP, the "International Federation of Information Processing;" and IJCAI, the "International Joint Conference on Artificial Intelligence."

-- The contracting parties of the "management committee" of ESPRIT Project No 1057, MIAC, "Multipoint interactive audio visual communication," met in Pomezia. Representatives of CSELT, FACE, BTRL, the Netherlands PTT, the Spanish telephone company, TRT, CNET, and STL attended.

8603/12947

CSO: 3698/M105

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

DANISH GOVERNMENT ALLOCATES 1.5 BILLION FOR HIGH TECHNOLOGY

Copenhagen BERLINGSKE TIDENDE in Danish 24 Apr 86 p 10

[Article by Jens J. Kjærgaard: "Debate on New Technology"]

[Text] Companies and researchers will gladly participate whenever an effort is made to evaluate the advantages and disadvantages afforded by the new information technology before it is put into use. A broad debate concerning the alternatives is clearly in everyone's interest. Such a debate is better and cheaper than trying to make corrections after the mistakes have been made. This is the essence of a report from the Technology Council.

Working through the Technological Development Program (TUP), the government has made 1.5 billion kroner available to companies and institutions in order that they might quickly and effectively start using computers, robots and other forms of new technologies. Of this sum, 20 million kroner will be used to pay for an evaluation of the social consequences.

In the course of the program's first year researchers and others concerned with the program have applied for 40 million kroner to finance 37 projects. However, resources are limited, and it is necessary to prioritize. For this reason, only nine projects have been started, receiving six million out of the total of 20 million kroner available.

The introduction of new technology entails a chain of decisions. There are new, positive possibilities, but there is also a danger of undesired social consequences. Problems which can affect the individual citizen, business production conditions or public services can arise. In this context, topics such as the changes which take place in the work environment as a result of the use of slaughterhouse robots, the effects of wide band communication technology on local communities and schools' and hospitals' needs for data processing are being considered.

We have succeeded in taking the first steps in a cooperative effort which is definitely not devoid of reasons for conflict. Integration requires understanding on the parts of both researchers and companies, who must play along and allow access to all necessary information, urges the planning committee.

8954/12795
CSO: 3698/0420

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALIAN S&T MINISTRY FUNDS CORPORATE RESEARCH EFFORTS

[Editorial Report] Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA in Italian on 12 February 1986 publishes a decree of the Minister for Scientific & Technological Research [MSTR] concerning the "admission of research projects to the interventions of the special fund for applied research." According to the decree, the programs listed below are "eligible for further contributions from the special funds for applied research" provided for by numerous laws and parliamentary deliberations dating from April 1968 to 15 January 1986. The following are selected records from this document which identify the company projects admitted to the fund, fields of research, and the terms of financing for government sponsorship:

Article 1

1) Aeritalia - Italian Aerospace Company - Napoli; large company classification

Place of execution: North

Purpose of the program: navigation, control and pilot systems for remote controlled aircraft (RPV) (second contribution)

Previous resolutions: MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by the decree of the Treasury Department; contribution to costs.

Maximum amount: 1,817 million lire as credit facility, not exceeding 35 percent of one-third of the allowed costs equal to 15,579 million lire;

1,817 million lire as contribution to costs, not exceeding 35 percent of one-third of the allowed costs equal to 15,579 million lire (this gives financing for two-thirds of the program).

Duration: 8-year amortization beyond the research time which must not exceed 5 years and 6 months.

Amortization: in 16 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1983.

2) Italian Aerospace Company - Napoli; large company classification

Place of execution: North

Purpose of the program: Defense aircraft (second contribution)

Previous resolutions: MSTR of 27 March 1985

Type of financing: credit facility at annual interest rate provided by the decree of the Treasury Department; contribution to costs.

Maximum amount: 3,945 million lire as credit facility, not exceeding 40 percent of one-third of the allowed costs equal to 29,590 million lire;

3,945 million lire as contribution to costs, not exceeding 40 percent of one-third of the allowed costs equal to 29,590 million lire (this gives financing for two-thirds of the program).

Duration: 8-year amortization beyond the research time which must not exceed 5 years.

Amortization: in 16 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1983.

3) Comau SpA - Grugliasco (Turin); large company classification.

Place of execution: North

Purpose of the program: Robots and automated chip-forming machines (last contribution).

Previous resolutions: MSTR of 27 March 1985 and MSTR of 5 July 1985.

Type of financing: credit facility at annual interest rate provided by the decree of the Treasury Department.

Maximum amount: 4,468 million lire as credit facility, not exceeding 80 percent of one-third of the allowed costs equal to 16,750 million lire.

Duration: 10-year amortization beyond the research time which must not exceed 4 years.

Amortization: 20 regular, 6 monthly installments to be paid at the end of each 6-month period; inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: August 1, 1982.

5) Enichem Sintesi SpA - Palermo; large company classification.

Place of execution: North.

Purpose of the program: New synthesis process for dimethylcarbonate (second contribution).

Previous resolutions: MSTR of 29 October 1985.

Type of financing: credit facility at annual interest rate as provided by the decree of the Treasury Department; contribution to costs.

Maximum amount: 1,313 million lire as credit facility, not exceeding 35 percent of one-third of the allowed costs equal to 11,262 million lire;

1,313 million lire as contribution to costs, not exceeding 35 percent of one-third of the allowed costs equal to 11,262 million lire [this gives financing for two-thirds of the program].

Duration: 7-year amortization beyond the research time which must not exceed 5 years and 6 months.

Amortization: in 14 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of interest and capital, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1982.

6) Fiat Auto SpA - Turin; large company classification.

Place of execution: North

Purpose of the program: high performance vehicles (last contribution).

Previous resolutions: CIPI [Interministerial Committee for the Coordination of Industrial Policy] of 22 December 1982 and MSTR of 28 April 1983 and MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by the decree of the Treasury Department; contribution to costs.

Maximum amount: 3,445 million lire as credit facility, not exceeding 35 percent of 15 percent of the allowed costs, equal to 76,760 million lire.

4,606 million lire as contribution to costs, not exceeding 40 percent of 15 percent of the allowed costs, equal to 76,760 million lire.

Duration: 9-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 18 regular, 6 monthly installments, to be paid at the end of each 6-month period, inclusive of capital and interest starting from the first 6 monthly due date following the completion of the program.

Program starting date: January 1, 1982.

7) Fiat Auto - Turin - Fiat Veicoli Industriali SpA; large company classification.

Place of execution: North

Purpose of the program: Innovative technological systems for automobile industry [fourth contribution].

Previous resolutions: CIPI resolution of 22 December 1982 and MSTR of 28 April 1983 and MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 2,366 million lire as credit facility, not exceeding 30 percent of 10 percent of the allowed costs, equal to 78,870 million lire;

3,155 million lire as contribution to costs; not exceeding 40 percent of 10 percent of the allowed costs equal to 78,870 million lire [this gives financing for 70 percent of the program].

Duration: 9-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 18 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the first 6 monthly due date following the completion of the program.

Program starting date: January 1, 1982.

8) Fiat Industrial Vehicles SpA - Turin - large company classification.

Place of execution: North

Purpose of the program: state-of-the-art design of subsystems for industrial vehicles, new diesel engines and combustion control systems (third contribution).

Previous resolutions: MSTR of 29 July 1983 and MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 1,693 million lire as credit facility, not exceeding 20 percent of 15 percent of the allowed costs, equal to 56,410 million lire;

2,539 million lire as contribution to costs, not exceeding 30 percent of 15 percent of the allowed costs, equal to 56,410 million lire [this gives financing for 80 percent of the program].

Duration: 9-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 18 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1982.

9) Fiat Industrial Vehicles SpA - Turin - large company classification.

Place of execution: North

Purpose of the program: state-of-the-art design of subsystems for industrial vehicles: cabins, structural weight reductions, transmission (last contribution).

Previous resolutions: MSTR of 29 July 1983 and MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 7,490 million lire as credit facility not exceeding 50 percent of 35 percent of the allowed costs, equal to 42,800 million lire.

Duration: 9-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 18 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1982.

11) Italtel Sit SpA - Milan; GTE Telecomunicazioni SpA - Cassina de Pecchi (Milano); large company classification.

Place of execution: North and South

Purpose of the program: new products for public switching systems and in particular Proteo (last contribution).

Previous resolutions: CIPI of 12 November 1982 and MSTR of 17 May 1984.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 8,063 million lire as credit facility not exceeding 30 percent of 20 percent of the allowed costs, 7,538 of which to be allocated to the Northern share and 525 to the Southern share.

Total allowable costs amount to 125,636 million lire for North and 8,749 for the South.

Duration: 8-year amortization beyond the research time which must not exceed 7 years.

Amortization: in 16, regular 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the first 6 monthly due date following the completion of the program.

Program starting date: January 1, 1980.

Special terms: fidejussion from STET.

12) Ing. C. Olivetti & C. SpA; Olivetti Accessories SpA; Elea SpA; Eleprint SpA; Engines and Electronic Equipment SpA; Manifattura Valle Dell'Orco SpA; Olivetti Peripheral Equipment SpA; Olivetti Synthesis SpA; Olivetti Tecnost SpA; Olteco [Olivetti Telecommunication] SpA; Tecsinter SpA; Teknecamp SpA; large company classification.

Place of execution; North

Purpose of the program: New developments in office automation, in distributed data processing systems, in telematics systems and networks and in personal informatics. First part (last contribution).

Previous resolutions: CIPI of 22 December 1982, MSTR of 28 April 1983, MSTR of 27 March 1985 and MSTR of 5 July 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 5,811 million lire as credit facility, not exceeding 20 percent of 12.5 percent of the allowed costs, equal to 232,429 million lire;

17,432 million lire as contribution to costs, not exceeding 60 percent of 12.5 percent of the allowed costs equal to 232,429 million lire.

Duration: 8-year amortization beyond the research time, which must not exceed 5 years.

Amortization: in 16 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1981.

13) Ing. C. Olivetti & C. SpA; Olivetti Accessories SpA; Elea SpA; Eleprint SpA; Engines and Electronic Equipment SpA; Manufactures of Valle Dell'Orco SpA; Olivetti Peripheral Equipment SpA; Olivetti Synthesis SpA; Olivetti Tecnost SpA; Olteco SpA; Tessinter SpA; Teknecomp SpA; large company classification.

Place of execution: North

Purpose of the program: New developments in office automation, in distributed data processing, in telematics systems and networks and in personal computing. Second part (third contribution).

Previous resolutions: MSTR 29 July 1983 and MSTR 27 March 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 26,699 million lire as credit facility, not exceeding 80 percent of 30 percent of the allowed costs, equal to 111,247 million lire; (this gives financing for 80 percent of the program).

Duration: 6-year amortization beyond the research time, which must not exceed 5 years.

Amortization: in 12 regular, 6 monthly installments to be paid at the end of each 6-month period, inclusive of capital and interest, starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1981.

16) SGS Microelectronics SpA - large company classification.

Place of execution: North

Purpose of the program: LSI-VLSI Mos integrated circuits, analog-digital integrated circuits, discrete components, integrated power circuits using VDMOS technology (second contribution).

Previous resolutions: MSTR of 5 July 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 27,015 million lire as credit facility not exceeding 40 percent of 30 percent of the allowed costs, equal to 225,131 million lire; (this gives financing for 40 percent of the program).

27,015 million lire as contribution to costs, not exceeding 40 percent of 30 percent of the allowed costs equal to 225,131 million lire.

Duration: 9-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 18 regular, 6 monthly installments, inclusive of capital and interest, to be paid at the end of each 6-month period starting from the second 6 monthly due date following the completion of the program.

Program starting date: February 1, 1983.

Special terms: fidejussion from STET (Telephone Financing Joint Stock Company of Turin).

17) Telettra Telefonica Electronica e Radio SpA - Milan; large company classification.

Place of execution: North

Purpose of the program: digital cable transmission systems, optical fiber and radio links for IDN development (last contribution).

Previous resolutions: MSTR of 27 March 1985.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 8,438 million lire as credit facility not exceeding 40 percent of two-thirds of the allowed costs equal to 31,643 million lire;

8,438 million lire as contribution to costs, not exceeding 40 percent of two-thirds of the allowed costs equal to 31,643 million lire.

Duration: 8-year amortization beyond the research time which must not exceed 7 years.

Amortization: in 16 regular, 6 monthly installments, inclusive of capital and interest to be paid at the end of each 6-month period starting from the second 6 monthly due date following the completion of the program.

Program starting date: August 1, 1981.

Article 2

The following programs are eligible for further contributions from the special funds for applied research provided for under the aforementioned laws, with the terms, the form and subject to conditions as indicated below for each one:

2) DEA Digital Electronic Automation SpA - Moncalieri (Turin); large company classification.

Pace of execution: North

Purpose of the program: Automatic processing cells.

Type of financing: credit facility at annual interest rate provided by decree of the Treasury Department; contribution to costs.

Maximum amount: 3,656 million lire as credit facility not exceeding 40 percent of the allowed costs.

3,656 million lire as contribution to costs not exceeding 40 percent of the allowed costs.

Duration: 8-year amortization beyond the research time which must not exceed 6 years.

Amortization: in 16 regular, 6 monthly installments inclusive of capital and interest to be paid at the end of each 6-month period starting from the second 6 monthly due date following the completion of the program.

Program starting date: July 1, 1983.

Special terms: fidejussion from STET [Telephone Financing Joint Stock Company of Turin].

11) Zetronic SpA - Padova; large company classification.

Place of execution: North

Purpose of the program: new connectors and switches for electronics.

Type of financing: credit facility at annual interest rate provided by decree of Treasury Department; contribution to costs.

Maximum amount: 2,168 million lire as credit facility, not exceeding 35 percent of the allowed costs;

2,168 million lire as contribution to costs, not exceeding 35 percent of the allowed costs.

Duration: 8-year amortization beyond the research time, which must not exceed 5 years.

Amortization: in 16 regular, 6 monthly installments inclusive of capital and interest to be paid at the end of each 6-month period starting from the second 6 monthly due date following the completion of the program.

Program starting date: January 1, 1985.

Special terms: capital increase by cash payment of not less than 2 billion lire to be made before the drawing up of the contract.

Copies of the present resolution will be passed on to the Treasury Department - DGT. to the CIPI Secretariat and to IMI [Istituto Mobiliare Italiano]. The resolution will be published in the Gazzetta Ufficiale [Official Gazette].

Rome, January 31, 1986.

8606/12624
CSO: 3698/M114

18 June 1986

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALIAN GOVERNMENT PUBLISHES RESOLUTION ON RESEARCH STUDIES

[Editorial Report] Rome GAZZETTA UFFICIALE DELLA REPUBBLICA ITALIANA in Italian on 22 April 1986 on pages 12-14 a resolution adopted on 20 March by the Interministerial Committee for the Coordination of Industrial Policy [CIPI] concerning the admission of company project proposals to the "special revolving fund for technological innovations" of the Ministry of Industry, Commerce and Crafts. The following are selected records from this document which identify the companies admitted to the fund, fields of research, and the terms of financing for government sponsorship:

Acerbi Veicoli Industriali SpA, small company classification

Object of the program: innovations in the road transport field by the introduction of advanced technologies and new materials.

Eligibility: (ex. Art 16 of Law No 46/82) resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Castelnuovo Scrivia (Alessandria).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982.

Maximum amount: credit facility 45 percent of the allowed costs equal to 655.544 lire.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 January 1984.

Estimated date of program completion: 30 June 1987.

Enichem Sintest SpA, large company classification

Object of the program: development of a technology for the production of hydrolytic enzyme proteins.

Eligibility: (ex. Article 16 of Law No 46/82) resolution of the ministers of industry, commerce and craftsmanship of 20 December 1986.

Place of execution: Ravenna, Pieve Vergonte (Novara) and Sesto S. Giovanni (Milano).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982.

Maximum amount: credit facility: 45 percent of the allowed costs equal to 4,028.400 lire.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 14 June 1983.

Estimated date of program completion: 30 April 1989.

Zanrosso SpA Mechanical Industries, small company classification

Object of the program: development of a new series of computerized machinery such as grinder boring and smoothing mills for the identification of endothermic engine components.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Malo (Vicenza).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46.

Maximum amount: credit facility: 35 percent of the allowed costs, equal to 596.328 million.

Amortization: 10 years beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 August 1984.

Estimated date of program completion: 31 December 1986.

MBC Meccanica Bellora Angelo s.r.l., small company classification

Object of the program: innovation of the process for the carrying out of a highly automated pilot plant by means of microprocessor devices destined for the production of multi-layer coextruded technopolymers.

Eligibility: (ex. Article 16 of Law No 46/82), resolution of the ministers of industry, commerce and craftsmanship of 17 February 1986.

Place of execution: Lonate Pozzolo (Varese).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982 (third paragraph).

Maximum amount:

- a) credit facility: 22.5 percent of the allowed costs equal to 348.262 million;
- b) contribution: to be calculated by the ministers of industry, commerce and craftsmanship starting from the date of the drawing up of the contract referring to the third paragraph of Article 16 of Law No 46/82, based on the 22.5 percent of the allowed costs, applying the calculation procedure of the mentioned law of Article 15.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 22 August 1983.

Estimated date of program completion: 31 December 1986.

MT Castoldi & Co SpA, small company classification

Object of the program: Continuous process, checked by microprocessors, for the production of high technology synthetic threads.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Parabiago (Milano).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982.

Maximum amount: credit facility: 45 percent of the allowed costs, equal to 2,727.155 thousand lire.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 19 June 1985.

Estimated date of program completion: 31 December 1986.

Organia SpA, small company classification

Object of the program: new procedures for the preparation of dispersions and polymeric solutions suitable for special applications for fiber processing (treating).

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Urgnano (Bergamo).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law 46, 17 February 1982.

Maximum amount: credit facility: 55 percent of the allowed costs, equal to 706,694,000.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 January 1984.

Estimated date of program completion: 31 December 1986.

Pirelli Industrial Accessories SpA, large company classification

Object of the program: New anti-vibration systems for automobiles and automation of the production process.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Milan.

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982 (third paragraph).

Maximum amount:

- a) credit facility: 22.5 percent of allowed costs, equal to 1,136,925 thousand lire.
- b) contribution: to be calculated by the Ministry of Industry, Commerce and Craftsmanship starting from the date of the drawing up of the contract referring to the third paragraph of Article 16 of Law No 46/82, based on the 22.5 percent of the allowed costs, applying the calculation procedure of the mentioned Law of Article 15.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 January 1985.

Estimated date of program completion: 30 June 1987.

Pontex SpA, small company classification

Object of the program: Electronic automation (FMS--Flexible Manufacturing System) of equipment for integrated systems.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Ozzano Emilia (Bologna)

Type of financing: credit facility at annual interest rate provided by Article 15 of Law 46, 17 February 1982.

Maximum amount: credit facility: 45 percent of allowed costs, equal to 1,464.136 thousand lire.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 April 1985.

Estimated date of program completion: 30 September 1986.

Urmet South, small company classification

Object of the program: design, development and application of new telematic system for users and of controls for special applications.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 11 October 1985.

Place of execution: Rome.

Type of financing: credit facility at annual interest rate provided by Article 15 of Law 46, 17 February 1982.

Maximum amount: credit facility: 55 percent of allowed costs, equal to 2,156.275 thousand lire.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 May 1983.

Estimated date of program completion: 30 April 1988.

Zagato Car s.r.l., small company classification

Object of the program: studies and production regarding the techno-economic suitability for the design of a new vehicle through the use of alternative materials.

Eligibility: (ex. Article 16 of Law No 46/82): resolution of the ministers of industry, commerce and craftsmanship of 20 December 1985.

Place of execution: Terrazzano di Rho (Milan).

Type of financing: credit facility at annual interest rate provided by Article 15 of Law No 46, 17 February 1982 (third paragraph).

Maximum amount:

- a) credit facility: 22.5 percent of allowed costs, equal to 420.630 million lire.
- b) contribution: to be calculated by the Ministry of Industry, Commerce and Craftsmanship starting from the date of the drawing up of the contract referring to the third paragraph of Article 16 of Law No 46/82, based on the 22.5 percent of the allowed costs, applying the calculation procedure of the mentioned Law of Article 15.

Amortization: 10 years, beyond the 5 years of utilization and preamortization starting from the date of the drawing up of the contract.

Program starting date: 1 July 1983.

Estimated date of program completion: 30 May 1987.

8600/12955

CSO: 3698/M109

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALTEL'S BELLISARIO ANNOUNCES AGGRESSIVE STRATEGY

Milan NOTIZIE ITALTEL in Italian Feb 86 p 3

[Article by Marisa Bellisario: "In 1985, for the 3d Consecutive Year, Positive Results by Italtel; Electronics Production now two thirds of total]

[Text] The customary end-of-year meeting by Italtel managers was held in Milan on 20 December. At the meeting, the appointed director summed up the most significant events characterizing the company's progress in 1985 and outlined the course to be followed in the years to come. In this article, Marisa Bellisario reviews the main topics dealt with, presenting data from the preliminary annual statement for fiscal year 1985.

The year 1985 ended with management and economic results that can be rated on the basis of preliminary data as positive and substantially better than in 1984.

The effective gross profit approached 200 billion lire, while the net financial burdens were further decreased. The aggregate turnover, around 1230 billion lire, reflected a modest increase determined both by the fixed-rate investments for public telecommunications specified in the ten-year plan of the Ministry of Postal Affairs and Telecommunications and carried out by SIP and other administrators and by the prices of electronic products, which decreased in monetary terms as well. The per capita turnover of the group rose from 57.9 million lire in 1984 to nearly 63 million in 1985 (in the case of ITALTEL leader SIT it rose from 84.2 million in 1984 to nearly 89 million), underlining the steady recovery of productivity by the company.

Electronic production rose faster than expected (reaching 65 percent of the total), especially in the area of public telephone switching, with the UT 10 central exchanges definitively asserting themselves (125 exchanges in the national network at the end of 1985). Expansion of the telematics sector has also intensified (in the case of the PABX [private automatic branch exchange] in particular), this confirming the trend toward further strengthening of ITALTEL'S technological autonomy and increasing competitive ability in terms of prices and performance. For example, in the area of activities relating to user systems alone, turnover increased almost 30 percent over 1984.

In 1985, ITALTEL's strategy of diversification toward innovative activities at the territorial level was further crystallized, through the TELESIS consortium, with projects for area systems such as ITACA launched in Alto Novarese.

This is a response to the growing demands for telematics services in Italy and a significant opportunity for creating new jobs.

Analysis of last year's results suggests two important objectives for the near future: constant attention to quality regarded as a strategic factor and philosophy of conduct and diversification toward new market segments, to be pursued above all in the telematics sector.

The agreement with ALCATEL, Plessey, and Siemens, recently extended to new areas of research and development, is seen to be a strategic course to be pursued to strengthen ITATEL's competitive ability.

The recent contract which ITATEL signed with China for delivery of technology in the digital transmission sector opens up new prospects on the international market. The large Chinese telecommunications market can offer significant opportunities for our technologies of interest to the industry of China, which has launched a massive development program. The year 1986 offers favorable prospects for our company, but there are also clouds on the horizon, especially as regards employment. We must face these problems realistically, keeping the basic objectives clearly in mind. On the one hand, the scenario calls for modest growth of the world telecommunications market, with prices tending to drop, and a domestic market marked by absence of increase in real-term investment by administrators. On the other hand, there is a telematics market showing a trend toward slower development than anticipated, particularly in the case of new applications.

Of particular importance to industry in this sector is the plan promoted by the Ministry of Industry for modernization of the telecommunications system. This plan, which calls for an increase of around 10 percent in investments, is awaiting examination by the Postal Affairs and Telecommunications Ministry, on the basis of the CIPE resolution of 1 August 1985. The ministry will decide on any modifications of the Telecommunications Ten-Year Plan. This national and international scenario requires us to be more resolute in the course begun in 1981. We are approaching this stage with our operational structure strengthened so as to upgrade internal management. In this context, the changes made and the new names at the top of the group, ITALTEL SIT, ITALTEL Systems, and the TELESIS Consortium, should ensure continuity in the process of consolidating and developing the firm. We will have to concentrate more and more on reaching certain key objectives--keeping pace with technological development and improving product quality; developing diversification and identifying new market areas; promoting commercial activities more vigorously in Italy and abroad; continuing improvement in the efficiency and productivity of the firm; and coping with the problem of loss of jobs resulting from the faster than anticipated decline in electromechanical technologies.

These are the main topics and objectives on which we must concentrate our efforts and day-to-day work, to be able to look forward to the future of ITALTEL calmly and with justified optimism.

6115
3698/429

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALTEL'S 5-YEAR PLAN EMPHASIZES TELEMATICS, EXPORTS

Milan NOTIZIE ITALTEL in Italian Feb 86 pp 4,5

[Article: "ITALTEL's 1986-1990 Plan: The 5-Year Programs"]

[Text] Over the 1986-1990 period the ITALTEL Group will consolidate its technological autonomy and competitiveness in terms of prices and services, so as to be in a strong position to compete on the domestic market, while developing a strong presence on foreign markets.

Initiatives will be launched at the same time to implement the objectives of diversification toward market segments and activities offering good opportunities.

The ability to keep up with the fast pace of technological development is becoming increasingly necessary in order for a manufacturer to be competitive in terms of product. Hence it is essential to have adequate research and development capabilities and to intensify cooperation with qualified partners. The action taken together with CIT-ALCATEL, Plessey, and Siemens is important for this purpose. In addition to the standardization projects now fully in progress, this cooperation between European industries can lead to joint industrial initiatives among the partners. Support by public authorities will be essential for this purpose.

ITALTEL SIT

The activities of ITALTEL SIT are operationally integrated into specialized structures capable of substantially independent operation in the context of the various sectors of the telecommunications market.

Public communications continue to represent the most important area of the ITALTEL group from the viewpoint of turnover, investment, and research and development. Over the next decade Western Europe is destined to become the continental telecommunications market of the greatest importance from the viewpoint of demand.

The European Community, which accounts for about 90 percent of the West European telecommunications network, will accordingly come to play a fundamental role in the telecommunications sector over the next decade, in view of the size of the market and the possibility of setting and pursuing common policies.

It is obvious in this context that the EEC (European Economic Community) is an extremely inviting target, both for manufacturers inside the EEC and major producers outside it, and that very definite steps are being taken to enter this market. Manufacturers having a strong production base are in an advantageous position in competition, one that can cause difficulty for manufacturers who cannot rely on an adequate production base even though they do have a strong system.

The agreements signed with GTE and TELETTRA in 1982 made it possible to reduce the number of switching systems in Italy, while bringing the total share of the national industry to 65 percent of the market.

It is nevertheless necessary to continue to broaden the ITALTEL production base, above all through significant increase in its share of the market in Italy, so as to create conditions similar to those on which domestic manufacturers can rely in France, Germany, and the United Kingdom. Such action should give much greater weight to Italian industry in the context of the EEC industrial structure and would thus provide the best preconditions for further broadening of the production base through timely alliances with other manufacturers and more aggressive export action.

In addition to the objectives of developing industrial cooperation, above all with European partners, in accordance with criteria of flexibility and gradualness (also in connection with European programs of the Race and Eureka type), the most important objectives of the plan are to guarantee development of digital switching systems from the current UT10/UT20 to the UT100, through a succession of products for the domestic market and to make the specific adjustments that will be required on foreign markets, by developing export activities and the pertinent equipment.

In the area of transmission, the multiplex and lines division, which is the most important one, is represented predominantly by PCM (pulse code modulation) equipment.

The turnover anticipated for PCM products will represent on the average 64 percent of the entire transmission sector turnover.

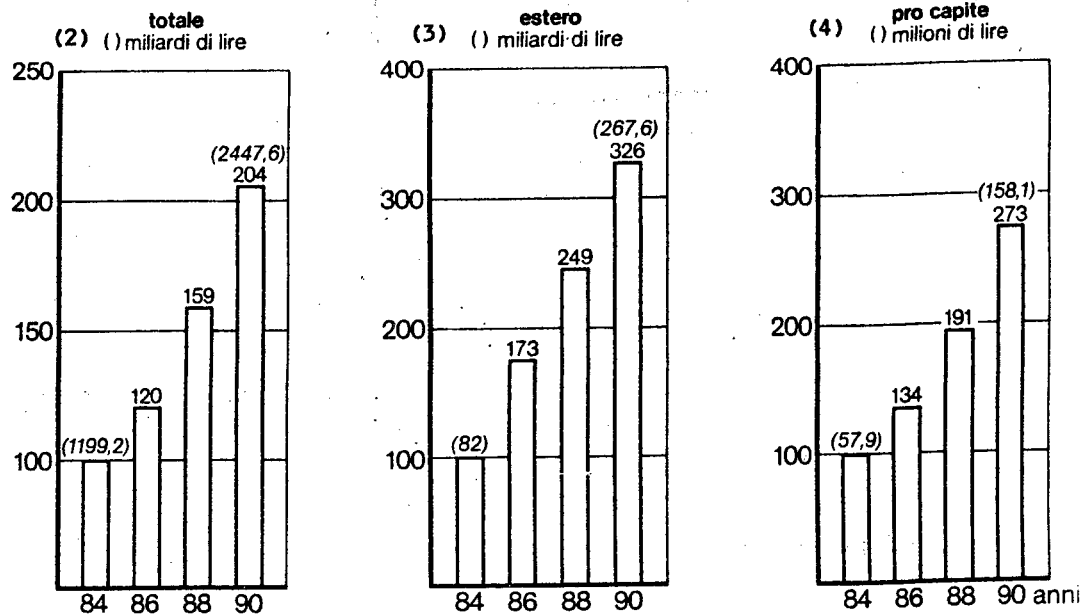
The microwave systems market (multichannel radio links) is of interest to ITALTEL, in addition to its intrinsic size, also because of its connection to the rural telephone market and the large private mobile networks.

The market is expanding rapidly as regards radio systems. The new 450-megahertz public radiomobile system, which is already in service, will be fully utilized over the period covered by the ITALTEL plan.

In the meantime, research is being initiated on the European 900-megahertz digital system, in which ITALTEL is participating with SEL, AEG, ALCATEL-Thomson, and SAT under the agreements signed by the agencies DPB (Germany), DGT (France), and SIP.

The market for rural systems in the developing countries is of considerable interest.

(1) Fatturato consolidato del Raggruppamento Italtel
(numeri indice)



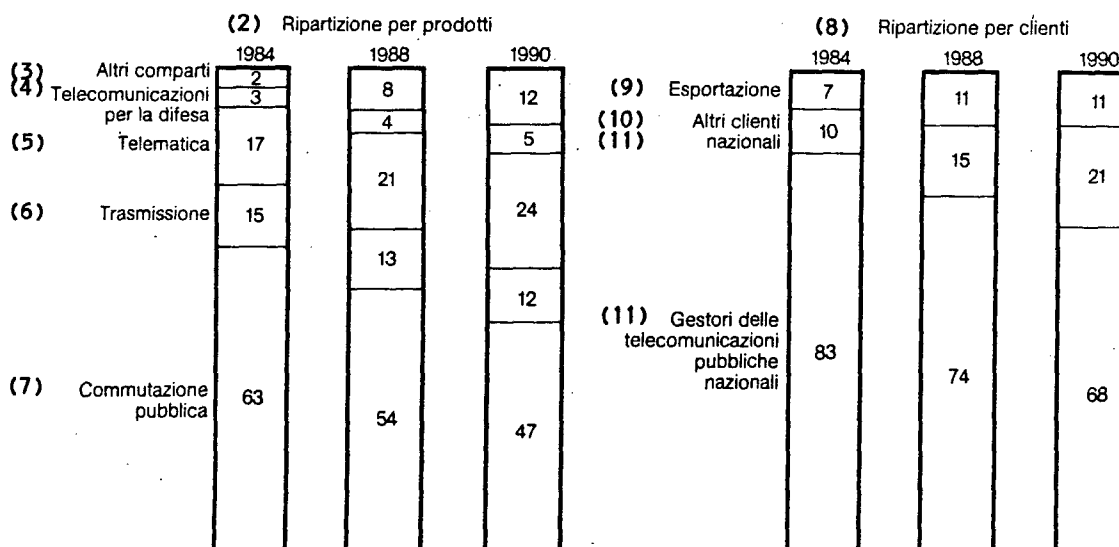
Key:

- | | |
|--------------------------------|-------------------------------------|
| 1. Aggregate turnover of the | 3. Foreign, () billions of lire |
| ITALTEL Group (index figures) | 4. Per capita, () millions of lire |
| 2. Total, () billions of lire | |

ITALTEL Telematica

Over the last 3 years, ITALTEL Telematica has completely updated its product list with products in line with the requirements of the market. This has resulted in regaining of market shares, both in the PABX (private automatic branch exchange) sector and in that of telematics products in general, with a sharp increase in turnover; restoration of economic balance from the deficit of 1982; strengthening of domestic know-how through creation of a research and development center at Santa Maria Capua Vetere employing 60 percent of the company's research workers; and containment of the impact on employment resulting from the rapid transition in production activities from electromechanical to electronic technology (the percentage of telematics personnel rose from 37 to 57 percent over the 1982-1984 period, there being a corresponding decrease in personnel in electromechanical production).

(1) Evoluzione delle attività Italtel



Key:

- | | |
|------------------------------------|---|
| 1. Evolution of ITALTEL activities | 6. Transmission |
| 2. Breakdown by products | 7. Public switching |
| 3. Other divisions | 8. Breakdown by customers |
| 4. Telecommunications for defense | 9. Exports |
| 5. Telematics | 10. Other national customers |
| | 11. National public telecommunications agencies |

Over the 3-year period from 1983 to 1985, ITALTEL Telematica consolidated and rationalized its organizational structure. The product line has been adapted for intercommunications equipment and PABX (of small, medium, and large capacity), telephones (standard, additional, multipurpose, auxiliary, integrated voice-data), terminals and modules for telematic systems (for office automation or for new services--facsimile, teletex, videotex; special terminals and network terminations).

On the basis of what has already been accomplished, action over the next 5 years should permit decisive strengthening of ITALTEL Telematica in a market going through what is essentially a crystallization period, in which the market is still far from having arrived at a coherent solution shared by all (manufacturers and users) who are interested in future integrated systems.

In the current world scenario lines of strategy will be followed which will permit reinforcement and development of the role of ITALTEL Telematica through

consolidation of its position of strength on the Italian market in traditional sectors and broadening it in new market areas in which new products will be offered. There will also be selective penetration of foreign markets.

ITALTEL Systems

The 1986-1990 plan stresses ITALTEL Systems' objective of coping with the anticipated heavy reduction in the traditional activities connected with electromechanical switching and the consequent decrease in personnel requirements, by means of strategies aimed at diversification of activities. In addition to its original mission, with ITALTEL Systems dedicated to operations connected with assembly, installation, testing, and maintenance of systems, apparatus, and plants (in the sectors of telecommunications, telematics, and civil and industrial plant engineering), the company has set itself the objective of significantly broadening its own market.

In keeping with this requirement, which will make ITALTEL Systems assume a more important role on the diversified market, up to the point of acting as a "general contractor" in the field of plant systems engineering and telematic operations with local applications, the company will develop its own marketing and project management capabilities more extensively than it has in the past. The ITALTEL TELESIS Consortium (which includes ITALTEL SIT and ITALTEL Telematica in addition to ITALTEL Systems) has been created with this end in view. It has the mission of operating as the marketing and merchandising structure of ITALTEL Systems to identify new commercial opportunities. The consortium is the result of a new organizational form devised to stimulate synergy among the companies of the group in order to intensify diversification. It is also to ensure integrated utilization of available know-how so as to implement plant/services applications solutions for a clientele increasingly oriented toward global and multiple-sector solutions.

The action program aimed at ensuring a more decisive ITALTEL Systems presence in the telecommunications sector, in remote control and management systems, and in plant engineering applied to the environment and to maintenance of technological systems fits into the context of this thrust toward diversification.

ITALTEL TELESIS

The formation of the ITALTEL TELESIS Consortium is a logical element in the pattern of intensifying operations aimed at diversification of markets and activities.

The purpose of building ITALTEL TELESIS as a consortium with structures oriented toward development and toward supply of infrastructural telematic systems/services (in both public and private sectors, by adding the industrial capabilities of ITALTEL telematics to the planning, design, and installation capabilities of ITALTEL Systems) is to rationalize the resources of the group on the basis of organizational solutions that exploit the feasible synergies to the greatest extent possible.

The specialized know-how required will be acquired from time to time at appropriate development centers both inside and outside the group, and also through a targeted cooperation policy.

The markets involved are represented basically by locally active organizations and agencies, that is public administration, whether central or local, the national health service, and small to medium-sized firms.

ITALTEL Tecnomeccanica

ITALTEL Tecnomeccanica designs, manufactures, and markets light steel and light alloy structures; the output consists of cabinets and frames for switching and transmission apparatus, metal strips, uprights, and distribution frames.

The operations of the firm have thus far been aimed at satisfying the internal needs of the group itself, which are steadily declining. This decline has led to the launching of a plan for diversification on the foreign market for control panels for industrial applications and their accessories. Specific technical, commercial, and organizational steps have been taken to this end to gain a good medium-term strategic position on the Italian market, one which can be defended on foreign markets.

The ITALTEL approach is characterized by a high level of innovation affecting the process of research and development, manufacture, and distribution as a whole.

The product is represented by the modular compound system designated as AUSO. This system, which is an entirely new departure as regards the customary standards and is extremely versatile, is produced with the latest technologies using high-output flexible manufacturing systems (FMS) that are computer programmed and controlled and are thus capable of producing a wide variety of configurations on a continuing basis, as a function of different customer needs.

6115

CSO: 3698/429

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ITALTEL, ALCATEL, PLESSEY, SIEMENS EXPAND R&D COOPERATION

Milan NOTIZIE ITALTEL in Italian Feb 86 p 14

[Article: "ITALTEL, ALCATEL, Plessey, Siemens: Cooperation Widened"]

[Text] The alliance between ITALTEL, CIT ALCATEL (France), Plessey (Great Britain), and Siemens (Germany) has been extended to new areas of research and development in public communications.

This cooperation centers on definition of standards and specifications which will make it possible to coordinate the VLSI (very large scale integration) electronic components used in the digital switching systems made by the four firms: UT by ITALTEL, E10 by CIT ALCATEL, System X by Plessey, and EWSD by Siemens. The joint work is directed toward present and future applications, especially those relating to the service-integrated digital network (RNIS), which are to satisfy market demands in the 90's. The collaboration activities have been based on investigation of two basic elements of public switching systems, the user card and the interfaces between the package switching network and the RNIS. The positive results obtained up to the present have made it possible to extend cooperation to three new elements: software development tools, user cards for RNIS, and certain aspects of wide-band networks.

The work that has been done shows that technical cooperation among the four main EEC manufacturing firms in the telecommunications sector can yield concrete results and has laid the foundation for joint participation in research and development programs at the European level. The four partners have submitted joint proposals for this purpose for the stage of definition of the EEC RACE project.

Commenting on the broadening of the agreement, Marisa Bellisario noted that "this proves that Europe is truly an area of growth in telecommunications. This is an essential condition for maintaining leadership in research and development on this continent, this leadership in turn being a prerequisite for ensuring ability to compete in the 90's and for providing employment."

6115
CSO: 3698/429

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

PERMANENT FRG COMMISSION ON TECHNOLOGY ASSESSMENT PROPOSED

Duesseldorf VDI NACHRICHTEN in German 11 Apr 86 p 1

[Article by G. Hartmut Altenmueller: "An Early Warning Network for Parliament: Standing commission on Technology Assessment Proposed"]

[Text] The Bundestag is to receive a permanent facility for technology assessment (TA). On 4 April, Dr. Josef Bugl, CDU MP and chairman of the Enquete Commission on Technology Assessment, which was established in May 1985, presented this proposal of the commission before a press conference in Bonn. The proposal is to be presented to the Bundestag before the summer recess.

Bugl himself hopes that a corresponding resolution will be passed by the parliament this coming fall. After extensive discussions, the commission, which consists of nine Bundestag delegates and eight technical experts, agreed on establishing this institution initially within the Bundestag itself: an alternative would have been to establish an external facility. The standing advisory body is to receive essential impulses for its work from a steering committee which is a part of the organic structure of the Bundestag, i.e., at the Office of the President. In a discussion with VDI NACHRICHTEN, commission member Prof. Dr. Meinolf Dierkes, president of the Scientific Center in Berlin for Social Research, pointed to one genuine innovation in comparison with all other TA facilities, i.e., that the steering committee will consist not only of politicians, but also of outside scientists with full voting privileges, so that the responsibility of both groups is clear. Like the Enquete Commission itself, the standing TA body is to consist of nine members of parliament and 8 experts. In the American Office of Technology Assessment, which is subordinated to the Congress, only politicians are represented with full decision-making authority. A delegation from the German Enquete Commission is at the American OTA this week on a fact-finding mission. The suggestion has been made that a small scientific staff be established to carry out the work of the TA office at the German Bundestag, which is to be established at the Parliamentary Administration. This staff would decide, for example, on whether a certain topic should be treated by means of a study, a hearing or a conference. Specialists from outside will be brought in from time to time. The TA office is to concern itself above all with mid and long-range technological-scientific problems which will require decisions by the Bundestag in the foreseeable future. From four to six topics will probably be

treated within a typical legislative period. Most of the studies will be delegated to external research groups which will form a network for this parliamentary early warning system. However, at least one study per legislative period is to be carried out by the scientific staff of the office itself, in order to enable the staff to retain its scientific competence. Topics should be formulated on a mid-range aggregation level, avoiding generalizations such as "information technology" or especially "computer-controlled drills" and focusing, for example, on "the impact of modern technologies on employment in the tertiary sector." An important factor in the independence of the TA office with regard to the executive branch is that it will receive and administer its own funds. It is estimated that approximately DM 5 million will be needed annually. Discussions in the Enquete Commission are still underway of the suggestion to include the Federal Lands and social groups in the assessment of technology, e.g., in the form of a foundation.

In addition to the question of ways in which a standing advisory capacity can be created, the Enquete Commission is also undertaking concrete assessments. These charges, which it received several months ago, concern expert systems, renewable natural resources and alternative agriculture.

On 30 September and 1 October of this year, an international symposium on "Parliament and Technology" is to take place in Berlin.

13139
CSO: 3698/0417

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG CONTRIBUTION TO R&D IN 1985 DM 52.2 MILLION

Berlin TAGESSPIEGEL in German 12 Apr 86 p 5

[Text] Federal Research Minister Riesenhuber announced yesterday in Bonn that the FRG is "among the world's leaders" in terms of the amount of funding it devotes to research. Referring to just published up-to-date facts from the Research Report, the minister added that additional efforts in the private sector over the past years have shown that the business sector does not want to rest on its laurels, but rather is competitively turning its attention to problems of the future.

According to statistics from the federal minister for research, in 1985 DM 52.2 billion was spent for R&D in the FRG; in 1984 the same figure was DM 48.5 billion. The minister pointed out that this was 2.8 percent of the country's total economic output, which means that the Federal Republic holds a leading position among the large industrial nations. Riesenhuber rejected the idea that the Germans could not compete in terms of top performance: "We are not the best in all cases, but we are successful in important areas." As examples he cited the automobile industry, nuclear technology, airplane construction, mechanical engineering and machine tools. Even in biotechnology, he said, there are top achievements; in the manufacture of semiconductors, however, there was some catching-up to do.

According to the report, the private sector's share in the financing of overall research expenditures rose from 56.7 percent in 1981 to almost 59 percent in 1985. The federal government's contribution remained approximately the same, at 25 percent, while the share of the federal Lands dropped from 16.5 to 14.5 percent, despite the establishment of technology parks and special subsidies by the Lands. In 1985, Bonn spent about DM 13 billion, with the Lands paying out 7.6 billion. Over 54.6 percent of the government's expenditures (in 1982 this figure was over 60 percent) ran over the budget of the federal minister for research and technology. 22 percent or about DM 2.6 billion of federal spending for research was devoted to defense research and technology. In 1982, this figure was still below 15 percent.

At the present time there are 380,000 persons employed in research fields in West Germany; of these, 134,000 are researchers.

13139
CSO: 3698/417

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

FRG KEY TECHNOLOGIES GROWTH, DEVELOPMENT POTENTIAL REVIEWED

Duesseldorf HANDELSBLATT in German 12 Apr 86 p 5

[Text] The modern key technologies can become an essential mainstay of market economic processes and a cornerstone for continued economic development in the 1990's. This view was expressed by the Institute of the German Economy in a study on modern key technologies.

Bernd Meier, the author of the book "Modern Key Technologies, Criteria and Development Potential" (Deutsche Institutsverlag GmbH), attempts to substantiate the concept of key technology in economic and social-theoretical terms and derives input and output criteria from the theory of economic development. He defines the social-economic prerequisites and effects of key technologies.

Among key technologies, in Meier's view, information and communication technologies, biotechnology, the new materials as well as laser and sensor technologies are of particular importance. He says that it is characteristic of these technologies that they enhance each other in their reciprocal interaction in such a way that their overall potential impact is greater than the sum of their individual effects (synergy potential). Meier claims that these new key technologies contribute greatly to the "creative self-steering" of many classical sectors, e.g., the automobile industry, mechanical engineering, electrical appliances, textiles. He believes that they are creating new growth markets.

Opening Up of New Markets

Despite the difficulties involved in forecasting the future economic market potential that can be tapped by the application of new technologies, products and processes, Meier describes in an exemplary fashion this potential impact of key technologies:

-Information and communication technologies: Production in the German electronics industry was in 1984, at DM 55.37 billion, 75 percent higher than that of 1974 (DM 31.47 billion). In 1974, the value of electronics production constituted 45.8 percent of the total production of electronic products, in 1985 this figure had reached 50 percent. Based on the "Eurotronics"

prognosis, the West European electronics market as a whole will grow between 1983 and 1988 by 11 percent, from 57.67 billion European currency units (1983: 1 Ecu = DM 2.27) to 63.95 Ecus (1988: 1 Ecu = DM 2.04).

-Biotechnology: The opening up of new markets through new technologies is also true for biotechnology. According to US estimates, product and process innovations utilizing new methods of biotechnology will open up by the year 2000 world market sales in overall terms of over US \$140 billion (1985: \$3.75 billion). The greatest share in the year 2000 should fall to the sectors of "energy, raw materials, the environment" (52.6 percent), followed by health care (30.3 percent), by fodder, foodstuffs (7.7 percent), chemicals (5.8 percent) and agriculture (3.7 percent).

-Software: It is estimated that total sales from the computer service sector (including engineering services) reached \$26.5 billion in the USA in 1982; this figure is expected to reach \$77 billion in 1987. This would correspond to an annual average growth rate of at least 23 percent. The greatest share will fall to software products alone, with \$29 billion in sales in 1987 in the USA. Since the middle of the 1970's, according to these observations, sales by the computer service companies have risen in most OECD countries by 10 to 20 percent annually.

-Laser Technology: Laser technology will also be of increasing importance for a new growth market. According to American estimates, the world laser market (including devices with built-in lasers) was over DM 11 billion in 1984; here, too, growth rates of more than 20 percent are expected.

Decentralizing Work

Innovations in the field of information and communication technologies, in Meier's view, will make it possible for work to be decentralized and for a more direct alignment to take place among the investment, consumer and labor markets. Furthermore, they will also contribute to the further development of the social market economy in the area of social policy. By means of the modern technologies, "new demands" on labor can be met, as well as new demands on a qualitatively improved and individualized consumption.

Meier believes that new technologies would, however, only lead to new, comprehensive innovations when the conditional framework for this step is given. Factors include the disposition of adequate human and material resources, a developed technology transfer as well as a large portion of willingness on the part of the individual and of society as a whole to accept innovation. Only when these conditions are met, Meier suggests, could new sales opportunities result which might coalesce into a new, long-range economic recovery.

13139

CSO: 3698/417

BRIEFS

NEW ESPRIT PROJECTS UNDER WAY--The European Commission is launching a new invitation to tender involving 62 million ECU [European Currency Unit] to finance new projects within the framework of the ESPRIT program. This umbrella will be divided among four fields of activity: microelectronics (17 million ECU), software technology (16 million ECU), advanced data processing (17 million ECU), and computer integrated manufacturing (12 million ECU). To date there are 110 projects under way: 268 million ECU have already been committed and nearly 700 million ECU will be necessary for their completion. Companies must submit their research projects before 1 July to participate in this new series of ESPRIT projects. An orientation seminar on the ESPRIT program is scheduled for 29 April in Brussels. [Text] [Paris ZERO UN INFORMATIQUE in French 28 Apr 86 p 7] 25004/12858

CSO: 3698/A137

WEST EUROPE/TECHNOLOGY TRANSFER

FRG AGREES TO HIGH TECHNOLOGY EXPORT CONTROLS

LD181753 Hamburg DPA in German 1506 GMT 18 Apr 86

[Text] Bonn, 18 April (DPA)--The FRG has agreed to the U.S. wish for restrictions on the export of high technology products within the framework of the SDI agreement. This emerges from a letter from the Ministerialrat [senior civil servant] Lorenz Schomerus of the Federal Ministry of Economic Affairs to U.S. Under Secretary of State Richard Perle, published in the latest edition of the news magazine STERN.

The magazine reports that the letter revealed the FRG Government intends to introduce compulsory licensing for the sale of embargoed goods and technologies to "certain groups of foreign countries." There also was a change planned in the rules for Third-country transactions with embargoed goods. A toughening of punishments for violations of the export control laws also was being discussed.

The letter also is linked to the agreement on the participation by German firms and research institutes in the U.S. research program for missile defense in space (SDI), which Bengemann signed 27 March. The exchange of letters also is published by the Bonn magazine ENERGIEREPORT and the Cologne EXPRESS, which already has published the text of the SDE agreement.

In an earlier letter to Schomerus 17 March, which SPIEGEL also quoted, Perle called upon the German side to provide many clarifications. So that the U.S. side could fully comprehend the German measures "it would be very helpful if you could describe various points in greater detail than is possible in the joint agreement."

Further on, the letter referred to mutual consultations which could possibly be of significance for restricting FRG exports to the East. Neither side was permitted to adopt measures which could be reversed until urgent consultations had been concluded. "That means we would both be prepared in urgent cases over a suitable period to refuse permission for the dispatch of embargoed goods in such a way that retrieval would be impossible." Schomerus' letter of reply does not contradict this U.S. view.

In Perle's letter, the United States also wanted to ascertain what measures the FRG would adopt to tighten up application of the COCOM embargo. In the U.S.

view, cooperation on this issue would be made easier if both countries "consult each bilaterally to harmonize our individual standpoints on the negotiations of the COCOM list." The embargoed goods on the COCOM list is drawn up jointly by all the countries involved. The Western COCOM agency, to which the NATO countries and Japan belong, lists those high technology products which may not be exported to the Eastern bloc because of their strategic importance.

In the letter the United States also asked for information on what changes the FRG will suggest to improve export controls and what punishments will be meted out in the event of a violation of the laws: "Is the FRG Government attempting to attain a level of punishment with the necessary severity in the new law in order to act as a strong deterrent to impermissible exports?"

/12232

CSO: 3698/0454

WEST EUROPE/TECHNOLOGY TRANSFER

FINNISH VALMET TO PARTICIPATE IN EUROBOT PROJECT OF EUREKA

Helsinki KANSAN UUTiset in Finnish 9 May 86 p 6

[Article: "Valmet Involved in Eureka Project"]

[Text] Along with 12 other top electronics firms, Valmet will participate in a developmental project in the process automation field. The project is linked to Eureka, Western Europe's collaborative venture in high technology. The project will take 6 years, and its estimated cost is over 100 million Finnish marks, reported Valmet on Thursday.

For the Eurobot project the firms are setting up a consortium which will develop a standard European information channel for local, real-time, industrial communications networks, especially for the needs of machine automation and the process industry.

"Eurobot will define the architecture of local industrial channels, and the firms which participate in it will develop linking devices for this channel. The common European standard will then create an important competitive advantage for manufacturers in the field," stated Valmet.

France's CGEE Alsthom acts as coordinator of the information channel project for factory automation, and besides Valmet the participants in it are France's Telemecanique, Merlin Gerin, and RTC Compelec, England's Foxboro and Rosemont, Italy's Carlo Gavazzi, Nuova Magrini Galileo, and Nuovo Pignone, the German Federal Republic's Eckardt and Krohne Messtechnik, as well as Portugal's Efacec.

In its own spheres of application, Valmet is a significant manufacturer of process automation in Western Europe. Its assortment of products covers both process automation systems and measuring/operating devices. Valmet believes that participation in Eureka's information channel project will strengthen and improve its competitive position and increase its advantage in international competition.

12327
CS0: 3698/470

EAST EUROPE/BIOTECHNOLOGY

BULGARIAN MICROBIOLOGY INSTITUTE'S ENZYME PRODUCTION

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 6, 1985 pp 35-41

[Article by Professor Milen Beshkov and senior scientists Pavlina Velcheva and Elka Emanuilova: "Microbial enzymes -- fundamental and applied developments in the Institute of Microbiology at the Bulgarian Academy of Sciences"]

[Text] Intensification of industrial processes using biocatalysts, or enzymes, is one of the pressing problems facing biotechnology today. Microbial enzymes are particularly important. Their broad application in different branches of industry, agriculture, medicine, etc. attests to their great importance to the economy of all countries.

As far as the application of enzymes worldwide is concerned, work is in progress chiefly in the following three areas:

- improvement of enzyme processes and their control by introducing constantly active reactors into classical fermentation processes;

- creation of biocatalysts using immobilized whole cells and purified enzymes;

- introduction of enzyme systems as active agents in control devices for the processes.

The production and application of microbial enzymes developed rapidly after World War II, as methods for the large-scale culture of microorganisms were perfected.

By 1980, world production of enzymes was valued at approximately 300 million leva. In 1981, enzyme production on the world market had reached about 65,000 tons, at a value of 440 million leva, and by 1990 it is expected to grow to 6 billion dollars.

Which major sectors of industry use enzymes? First and foremost, general chemistry, which uses neutral, alkaline and acid proteases. The food industry is the leading consumer of microbial enzymes devouring about 80 percent of the world production of enzymes -- glucose isomerase, alpha-amylase, heat stable alpha-amylase and glucoamylase for processing starch as a substrate for

glucose and its isomerization to fructose using an enzyme fermentation method. The enzyme beta-galactosidase is widely used to derive greater use from the lactose in whey. Microbial pectolytic enzymes are widely used in brewing, and cellulose enzyme complexes are used in the production of spirits and microbial protein and plant rawstuffs and in the production of mixed fodder. Enzymes that break down fats -- lipases -- are of interest for the production of many goods and for medicine. The use of microbial enzymes in the field of precision biosynthesis and the transformation of organic compounds has been described as highly effective. There is a promising future in medicine and the pharmaceutical industry for the application of enzymes that have been isolated in a pure form. In this respect, many microbial enzymes are widely used as diagnostic tools in human and veterinary medicine and in enzyme immunoassay. Microbial enzymes also show promise in the creation of sensitive measuring devices and sensors, enzyme electrodes, mechanical enzyme sensors and thermistors, light-sensitive elements, etc. Another progressive trend is the use of enzyme complexes to purify waste water.

The rapid development of chemical enzymology has laid the foundation for the creation of a new type of heterogeneous biocatalyst -- immobilized enzymes. Their application is notable for great economic efficiency due to the possibility of multiple use, continuity of process, increase in pH and heat resistance of the enzymes. No less important for the application of intracellular enzymes in manufacturing processes are immobilized enzymes that are used in medicine as a means of obtaining a genetically determined lack of enzymes in the human organism or of specifically destroying undesirable products of metabolism in a number of diseases. A particularly promising area is the use of light energy with the aid of isolated photosynthesizing enzymes. These successful investigations represent a real contribution toward resolving the problem of finding new sources of energy -- a problem of colossal social and economic importance for mankind. The application of heat stable enzymes is also promising, permitting accelerated processes at higher temperatures.

This short review indicates the broad application of microbial enzymes and the current status of research developments in this field.

If we are able to speak today of definite scientific and applied scientific achievements in the field of microbial biosynthesis of enzymes in the Institute of Microbiology at the Bulgarian Academy of Sciences, it is thanks to the long-standing traditions, scientific groups and use of modern methods of research in this field. The purposeful, fundamental, applied scientific research in this field dates from the very first years of the creation of the Institute of Microbiology at the Bulgarian Academy of Sciences. Soon after came the first successes, for example the Dimitrov prize was awarded to members of the group for the work "Bacterial proteases and their application in dairying" and "Pectolytic preparation 'Bistrin'" (in 1952) and 15 years later for the work "Fermented preparation with proteolytic action produced from microorganisms (E30)".

As a matter of fact, the production of an enzyme of microbial origin is a complicated and complex problem. It involves careful screening to isolate or yield genetically highly active strains, studying their physiological, morphological and biochemical properties, discovering certain characteristics

of the biosynthesis of the given enzyme and the regulatory pathway of enzyme synthesis. Based on these studies, and using a statistical approach, an economically viable nutritional medium must be found, culture parameters established, and laboratory techniques created for maximum use in conditions of semi-production and production. We must also determine the characteristics and properties of the finished product in order that suitable methods may be found for its application, which in many cases will impose certain corrections in existing production regulations. All this requires thorough scientific research, without which it is impossible to introduce developments into practice.

Hydrolases have been the major object of research in the field of biosynthesis of microbial enzymes in the 35 years of scientific work in the Institute of Microbiology at the Bulgarian Academy of Sciences. This area of research has produced the following more important theoretical scientific results, given below.

Certain laws connected with natural instability have been elucidated, such as the dissociation of forms in bacilli and streptomycetes and their effect on the biosynthesis of strains. The nature of the constituent parts of the enzyme complex in *B. mesentericus* (milk clotting and proteolytic), in the genus *Humicola* (acid protease) and in *E. rhusiopathiae* (neuraminidases) have been determined. Certain characteristic links have been established between the structural changes of the strains from the morphological point of view and their bioproductivity in relation to enzymes (amylase, glucoamylase, acid protease, etc.).

The allosteric nature of the enzyme glucose oxidase was demonstrated for the first time and a model developed for its catalytic action. Certain aspects of the mechanism of substrate-enzyme interactions and characteristics of biosynthesis have been elucidated, as has its regulation in a number of enzymes (fibrinolytic, pectolytic, glucoamylase, glucose isomerase, etc.). Certain characteristics of the mechanism of action of microbial enzymes on different substrates have been discovered. Studies in a model of enzymes isolated in a pure form have yielded data on the kinetics of processes of hydrolysis and heat denaturation in the enzymes (glucoamylase, heat stable amylase). Certain characteristic aspects of induced biosynthesis in bacterial proteases, amylases, mold proteases, neuraminidases, ribonucleases, glucose isomerases, etc. have been established. biosynthesis of a specific inhibitor complex of *B. mesentericus* against its own proteases and its probable role as a regulatory mechanism of enzyme action in the cell have been demonstrated.

Below we shall indicate the achievements of the Institute of Microbiology at the Bulgarian Academy of Sciences. These are developments in the field of enzymes that have been concluded and introduced (or are about to be introduced) and also certain scientific developments in this area that appear promising.

In the field of proteolytic enzymes.

In 1972 we introduced the first enzyme with proteolytic action, E30, which became the basis for the production of the Bulgarian biopreparation "Biopon". Due to its broad substrate specificity and original structure, the preparation aroused a great deal of interest among scientists of different specialities outside the institute. The first Bulgarian milk-clotting bacterial enzyme, "Sirenin" was also developed at the Institute of Microbiology. It was developed with the aim of finding a suitable substitute for the cheese yeast "Khimozin" -- in short supply worldwide -- which would serve to produce a quality product and a good yield. Early research on this problem began under the leadership of Academician I. Emanuilov. As a result of many years of experimental work and extensive scientific investigations in microbiology and biochemistry, conducted by a large number of specialists, two strains were selected which were characterized by high milk-clotting and a comparatively low proteolytic activity. It was shown that a neutral protease with an optimum pH of 6.7-7.0 predominated in the enzyme complex that was biosynthesized from these strains which, as demonstrated by the mechanism of action on casein, resembled most closely the cheese yeast "Khimozin". The bacterial enzyme "Sirenin" was introduced into regular production in 1983. The results of industrial experiments to produce soft and hard cheeses have demonstrated that the product produced with "Sirenin" complies with the specifications of the Bulgarian state standard and differs neither in quality nor yield from that produced using "Farmakhim", the cheese yeast used in current production. By way of mutagenesis using gamma rays and selection, a mutant strain of the genus *Humicola* is produced which demonstrates a higher proteolytic activity in comparison with the initial strain. Comparative studies of the ultrastructure of the initial strain and the mutant variant under conditions of maximum enzyme biosynthesis have demonstrated the presence of cellular structures in the mutant strain which are associated with the formation and secretion of the enzyme in the medium. Based on extensive, complex investigations of the characteristics of the strain and factors that determine the maximum production of complex biosynthesized acid proteases, laboratory techniques have been developed to produce the enzyme. Viability charts have been developed to produce enzymes with varying degrees of purity and a good yield. The enzyme produced -- an acid proteinase with its own specific properties and an optimum pH, extends the range of such products produced in Bulgaria and will find application in various branches of our industry, above all in leather work.

In the field of enzymes used in the manufacture of starch and glucose.

a) glucoamylase. In 1983 and 1984 two techniques for the production of the enzyme glucoamylase based on microbial principles were introduced in the medical chemistry complex in Botevgrad. At present, in the Institute of Microbiology at the Bulgarian Academy of Sciences, we are working on improving the opportunities for biosynthesis of the strain *Aspergillus niger*, using natural selection, researching enzyme biosynthesis, from the biochemical point of view, and its regulation, and particularly on the problem of finding suitable inductors. We have established a close relationship between the degree of polymerization of hydrolyzed products and their inductor capacity. In order to determine the most suitable technical conditions for the

application of the enzyme, a glucoamylase preparation is produced according to a complex protocol as a result of which the kinetics of the degradation of the substrate starch are studied. Based on the findings to date, we have determined that the optimum conditions for its application will be in industry. It has been shown that this enzyme can fully replace the enzyme imported from abroad for the needs of our starch manufacturing industry. b) Heat stable alpha-amylase of bacterial origin. Via a mutagenic process with methyl-nitrous-guanidine, a highly productive mutant strain, *B. licheniformis*, has been produced and selected -- a product of heat stable alpha-amylase. Electronmicroscopic studies of the mutant strain have demonstrated differences compared with the initial strain, along with certain physiological, biochemical and morphological characteristics. Changes in the cell wall have been confirmed which are associated with secretion of the enzyme. Based on a detailed study of the optimum conditions of intermittent cultures, a laboratory technique has been developed and a liquid enzyme concentration of heat stable alpha-amylase produced which in its properties -- activity and heat stability -- is not inferior to "Termamila", the preparation of heat stable alpha-amylase from the Danish firm Novo. Successful experiments are being conducted for the application of the enzyme concentration for destarching tissues, in brewing and for producing glucose from starch. From the cultured liquid of the strain (the initial strain) an enzyme has been isolated and purified which is serving as a model for research and elucidation of certain aspects of its heat stability. A specific link has been established between the protective effect of metal bivalent ions on the heat stability of alpha-amylase and the extent of conformation changes occurring in the molecule of the enzyme at corresponding heat treatment. It has been demonstrated that the protective effect of the monovalent ions Na^+ and K^+ against heat denaturation of the heat stable alpha-amylase at temperatures above 80°C is due to a different mechanism. The regulation of synthesis in conditions of continuous culturing was studied in a model of heat stable alpha-amylase. It was established that at carbon limitation there is a definite link between the rate of enzyme production and the rate of rarefaction. At low growth rates, biosynthesis of heat stable alpha-amylase increases when the nitrogen content in the medium is reduced. c) Glucose isomerase. Based on extensive screening, two highly active strains of the genus *Streptomyces* have been isolated. The optimum conditions for enzyme biosynthesis have been established. We have developed a method for immobilization of microbial cells and optimization of the conditions for isomerization in a continuous column process under laboratory conditions. We have demonstrated that these preparations isomerize glucose syrups up to 42 percent, converting them to fructose when magnesium ions are reduced and cobalt ions absent. The results are the subject of licenses and patents in 12 countries. The laboratory techniques developed will shortly be tested in semi-industrial conditions.

Enzymes applicable to the production of glucose-galactose concentrations -- beta-galactosidase. As a result of selection studies, two promising yeast strains have been improved. We have studied their physiological and biochemical properties and the effect of different factors on biosynthesis of the enzyme produced from them. The statistical design of the experiment enabled us to optimize the nutritive medium and repeated increase of activity

was achieved. We established that the presence of manganese and calcium ions were particularly important for the biosynthesis of the enzyme.

Lysine decarboxylase.

Based on studies of the physiological and morphological characteristics of the selected strain and conditions of enzyme biosynthesis, a laboratory technique has been developed and introduced at the Institute of Microbiology at the Bulgarian Academy of Sciences to produce the enzyme lysine decarboxylase (a technical product).

The same [technique] is used in the control analyses for the production of L-lysine at the microbial products factory in Peshtera. Organized production not only satisfies our country's needs of this enzyme but is also a subject of interest to foreign firms (in England and the Federal Republic of Germany).

Neuraminidases and their substrates.

Neuraminidases of microbial origin have an important use in laboratory practice for biochemical, immunological, histochemical and cytostatic research. As a result of studies in two model strains (both pathogenic and non-pathogenic) of the conditions of enzyme biosynthesis laboratory protocols for the isolation and purification of the enzyme have been developed in the Institute of Microbiology, and active preparations have been produced and tested successfully for use as diagnostic tools in the Laboratory of Immunology at the Medical Academy, Sofia, and in the Department of Virology. The enzyme has been introduced into laboratory practice at the latter. Detailed characteristics of both enzymes have been documented according to a series of indices and these have been used as models to elucidate certain problems associated with substrate-enzyme interactions and inducible biosynthesis from a biochemical point of view and to discover certain characteristics of the topography of their active center by way of modification of active groups of the same with selective inhibitors. A method has been developed for isolation of a glucose macropeptide as a substrate to determine neuraminidase activity in bacteria and viruses. This has been introduced at the Institute of Microbiology at the Bulgarian Academy of Sciences, the Department of Virology NIZ at the Medical Academy, Sofia, and at the IVMC at the USSR Academy of Sciences in Leningrad.

Ribonucleases of yeast origin.

Basic research in this field is directed toward studies of the regulation, conditions and mechanism of biosynthesis of RNase in the model *Candida lipolitica*. As a result of the research conducted, conditions for enzyme biosynthesis have been optimized and certain problems concerning its regulation have been elucidated. The enzyme is characterized by a series of properties. It has been established that RNase from *Candida lipolitica* is a heat stable, acid resistant enzyme, which is of great significance for its application. From the point of view of applied science, it is of interest that the group has confirmed a property of the enzyme ribonuclease that depresses to a considerable degree the production of groups of viruses in vitro and in vivo, in cell cultures and in experimental infections in white

mice. The enzyme complex, administered in non-toxic concentrations, does not affect the reproductive activity of the aspirantor-sinsitien virus in a model persistor system. These investigations demonstrate the potential opportunity for application of the enzyme as a medication.

Membrane-associated enzymes and their dependence on the lipid component of the microbe cell. The lipid-protein interactions in the membrane of *B. subtilis* have been studied using a model of the membrane-associated enzyme, ATPase, which was isolated and produced in a purified and soluble form. To demonstrate the dependence of the enzyme on the type of lipids around it, it was included in liposomes of a different lipid component -- both native lipids, isolated from membranes of the same microorganism, and synthetic lipids. It was confirmed that the negatively charged lipids, such as glycerophosphatase had an activating effect on enzyme activity. Cytochemical electron microscopy showed that the enzyme is located chiefly in the membrane structures of the cell (cytoplasmic membrane and liposomes). Based on specific inhibitors of lipid biosynthesis, it was shown that when lipid synthesis in *B. subtilis* was destroyed, the enzyme was revealed cytochemically in a much smaller degree than in the normal cell.

This short review of the achievements of the Institute of Microbiology at the Bulgarian Academy of Sciences in the field of microbial enzymes demonstrates that it has established itself as one of the principle groups in our country involved in problems of both pure science and applied science in this field.

It must be emphasized that, in this sense, the subjects of research in the institute relate to the most pressing problems associated with the constant growth of the needs of enzyme preparations in different sectors of our economy. On the other hand, in the institute we have initiated studies of a purely scientific nature that are promising and will be necessary to the development of more profitable techniques in the future. In that respect, the Institute of Microbiology is making a real contribution to the fulfilment of one of the principal projects of the national program for biotechnology -- the production and application of enzymes.

12907
CSO:2202/14

EAST EUROPE/BIOTECHNOLOGY

GDR INSTITUTE DEVELOPS MATERIALS FOR ARTIFICIAL ORGANS

East Berlin SPECTRUM in German No 1, 1986, pp 1-3

[Article by Dr Robert Becker, Central Institute for Organic Chemistry:
"Biomaterial for Artificial Organs"]

[Text] A collective which developed new biomaterials and membranes for human medicine was honored last year with the National Prize First Class for Science and Technology. Members of this collective included, in addition to the author of this article, Prof Volker Groebe of the Erich Corens Institute for Polymer Chemistry and Horst Klinkmann, corresponding member of the Academy. What follows is a description of new trends in the replacement of tissues and organs from the viewpoint of the polymer chemist.

The natural ability of the biological system, of the human organism, is often not sufficient for the therapeutic restoration of diseased or destroyed tissues or organs. This raises the question of replacement and correspondingly of the material to be used for the replacement part. The obvious solution is that of "similia similibus substituntur," the transplanting of tissues or organs. But the choice of this method gives rise, however, to the difficult problems of availability and of the phenomenon of rejection.

For this reason, experiments have been carried out for centuries using artificial materials for therapeutic purposes, as an alternative to the use of biological materials. The use of precious metals as a replacement for hard tissues can be traced back as far as the Middle Ages. As early as 1588, there are reports of the repair of a cleft palate by means of a gold plate. But not until the 1950's--in keeping with the rapid developments in the plastics industry--did materials begin to be manufactured which corresponded in an optimal way to the needs of therapeutic medicine. Just one decade ago, medical technology had to depend on those materials which in any case were being produced by industry. In the meantime, however, there has come to be general recognition all over the world that only specialized materials research can form the basis for an effective solution for the replacement of tissues or organs, and that this can thereby represent a new form of medical therapy. Biomaterials research is today an established and highly advanced research direction. Its problems are closely related to those of

biotechnology, its economic impact is no less significant than that of microelectronics.

In addition to pure and precious metals, special carbons, certain ceramic materials and above all the variegated field of polymers form the reservoir of synthetic biomaterials which can be used as substances for tissue replacement and which also form the basis for the manufacture of artificial replacement organs. The polyurethanes hold a critical position within the group of polymer materials. This is due not only to the well-known variety of physical and chemical properties of this group of synthetics, but also to the fact that polyurethane is superior to most other polymer materials with regard to its hemo-compatibility. Thus this group of substances is able to meet in an optimal way the very varied requirements of experimental medicine. Polyurethanes are therefore a focal point of international research in the area of synthetic biomaterials, and since the end of the 1970's a research group of the Central Institute for Organic Chemistry of the Academy of Sciences has devoted itself within the framework of the major research direction "Artificial Organ Replacement and Biomaterials" especially to this problem area. Since then, two of the internationally most important PUR biomaterial systems have been developed on the basis of own materials with in part new problem solutions. A conducting system for the hollow-fiber dialyser of the artificial kidney are being produced (SYSpur EG 7401 of the Schwarzheide VEK Synthesewerk), a highly flexible polyurethane, which can be used for the artificial heart, among other things, is available as an experimental product under the trademark "Endopur H." State-of-the-art research on an international scale is also being carried out in applications research, in close cooperation with medical facilities. The problems of such a development are described in the following.

Requirements of Biomaterials

The list of required properties first focuses on mechanical attributes. Even today, this is still the most important criterion for the use of a particular material. The fact that polymer substances, above all soft and extremely flexible systems, play an important role in the selection of materials is quite obvious.

As far as the stability of media is concerned, what is important in the case of materials used for medical purposes is above all enzymatic-hydrolytic stability, which is important for long-range implantation, i.e. longer than two years, but which is very difficult to achieve. In the face of the decomposition that occurs within the organism, the problem is not so much the formation of toxic by-products as the loss of mechanical properties.

The variety of possible applications of synthetic biomaterials is pointed up by the fact that a specific decomposition of the material with complete resorption of the products of decomposition can be expressly desired for certain types of applications, such as for adhesive substances or suture materials.

A special requirement for medical utilization is that materials can be sterilized. The customary sterilization method of heating to 121 degrees

Celsius cannot be used for temperature-sensitive polymer systems. Nor is the usual alternative of gas sterilization using ethylene oxide always the method of choice, since many polymers release this gas and small traces of ethylene oxide can have a carcinogenic effect. For this reason, interest today is focussed on materials which can withstand unscathed sterilization using gamma rays.

The requirement that products be of medical purity is in our experience one of the most critical barriers for the developers of materials. The implementation of products in the medical field is subject to strict licensing regulations. In accordance with these regulations, all materials which come into contact with bodily substances, in particular with blood, are treated as medicaments. But commercial polymers ordinarily contain such high percentages of monomers and low-molecular oligomers, solvents, softeners, catalysts and other additives that they are a priori not suitable for medical applications. One must therefore begin with very pure starting materials or, what is usually more difficult, subsequently subject the polymer to a purification process.

The polymer chemist is therefore confronted with a number of new types of problems, which require him to approach materials development in a different way. But the industries which manufacture and process materials are also forced to learn to think in unaccustomed categories of purity.

Finally, for all materials which come into direct contact with body cells, the requirement of optimal biocompatibility exists. The organism reacts to any contact with extraneous material with a more or less dramatic defensive response. This response is especially pronounced with regard to living tissue; we can recall the above-mentioned phenomenon of rejection in the case of natural organ substitution. But synthetic materials also provoke such a reaction. Hard tissue reacts more cautiously, but blood is much more sensitive. For this reason, hemocompatibility is a key research problem.

Let us dwell a bit longer at this point. All biomaterials presently used as intra-corporal replacements (such as substitute blood vessels) or in the form of extra-corporal systems (such as blood-conducting systems for dialysis) cause the blood to clot and thrombi to be formed. In vascular replacement surgery, the thrombi can be eliminated by enclosing and retaining them within the microporous surface of the artificial blood vessel. In the second case, negative occurrences must be counteracted by means of additional therapeutic measures. This simply means the introduction of coagulants, especially heparin, into the circulatory system. This concept, which is unsatisfactory because it is purely symptomatic, which we call therapy-concept, is the method that is customary today and the only one used for short-term treatments, but of course it does not imply a solution for the problem of hemocompatibility.

Among polymer materials, polyurethanes, by the way, are far and away the leaders as far as hemocompatibility is concerned. The reasons for this are probably due to the fact that because of the complicated micromorphology of these polymers, the detection system of the biological organism is outsmarted. In this area we may look for a key to the solution of the problem.

The reciprocal interaction of living cells with the surface of the biomaterial is the point of departure for all reactions of the biological tissue. Thus it is obvious that this reciprocal interaction should be minimized as much as possible. This causally-oriented minimization concept is used, for example, as a basis for experiments to drastically reduce the surface energy of a polymer by means of the introduction of siloxane components or to make the surface area especially hydrophilic. One of the best-known applications of this principle is to be found in contact lenses based on hydrogel, which have been around for decades. The realization of this principle leads to inert products such as we know from glass carbons, bio-ceramics or corrosion-proof metal alloys.

The use of inert biomaterial avoids any type of negative reaction, but constantly represents an alien body within the organism. Therefore the ideal of the biomaterials researcher is the realization of the optimization concept, i.e. the development of a "benign reactive material" which is not only tolerated by the organism, but which is included in metabolic processes. Although this goal sounds almost utopian, nonetheless there already are concrete notions of how this may be brought about. For example, certain "bio-active" ceramics can be grown together gap-free with bone, i.e. without encapsulation in connective tissue. In certain cases, they are already being used today for the replacement of hard tissue. For soft tissue, however, the goal is much farther off. A few starting points might be mentioned. The conceptual model of "hybrid systems," for example, is already being used experimentally. These are systems in which natural cells are introduced onto a synthetic substrate or encapsulated in synthetic microporous material. Here, biomaterials research is building a bridge to biotechnology. Since already today success has been achieved with the use of artificial vascular replacements in causing the organism to develop its own tissue structures, this points to a future in which synthetic biomaterials will only act as germ cells for the internal rebuilding of biological subsystems. After sufficient excitation of the natural regenerative ability of the body, the biomaterial can then be completely broken down.

Biomaterials in Practical Testing

Let us now turn to a few practical possibilities, particularly of the application of biomaterials based on polyurethanes.

Simple regeneration aids should ideally not remain in the body but be resorbable without leading to any complications. This requirement is fulfilled by a tissue adhesive which can be used in trauma surgery or for the treatment of aneurysms.

Artificial blood vessels are the most common form of soft tissue replacement. In their microporous casing, the organism builds up a new vascular structure. Therefore, in this case as well, it is possible to conceive of the use of degradable materials.

Bio-active ceramics have established a new generation of hard tissue substitutes. Composites with polyurethanes open up the possibility of adapting the module to that of the natural tissue, without sacrificing bioactivity.

An initial step in the simulation of metabolic processes became possible through the use of synthetic membranes. The artificial kidney is the most impressive example of this. Clearly superior in terms of hemocompatibility to the previously used cellulose, polyurethane membranes are expected to play an important role in the further development of blood detoxication systems.

The use of artificial organs is not limited to substitutes of one material, but only becomes truly efficient in more complex systems. Here polyurethanes assume an important position as construction materials. Thus a ventricle of the artificial heart may be composed exclusively of polyurethane; the manufacture of the pump membrane, however, is only possible with the use of this material. Polyurethanes are used in a wide variety of applications in the field of biomaterials: used exclusively as imbedding material for the hollow fibers of the dialysis cell of the artificial kidney, used in tests as a sealing compound for heart pacemakers, used as an indispensable material for certain catheters and tubing.

Many possible uses, both in the planning stage and fully realized, must go unmentioned here. Of the many future aspects, microcapsules could be mentioned, whether giving off active substances as containers of medicines, whether absorbing harmful substances as detoxication systems or even as hybrids with metabolic functions.

Even though polyurethanes are today dominant also for intra-corporal implementation, the wealth of variants in the entire field of polymers must be used for the further development of biomaterials.

[Photo Captions]

1. The photo shows the most varied kinds of biomaterials: the lower part of a ventricle housing, a hip acetabulum, a Bolland catheter for unburdening the heart, a vascular replacement and a hollow-fiber dialyser of the artificial kidney.

2. Schematic drawing of an artificial heart.

3. Dr. Robert Becker (center), one of the national prize winners of the Biomaterials for Human Medicine Collective, with his colleagues Dr. Gert Neumann and Esther Virgens.

12792

CSO: 2302/14

EAST EUROPE/COMPUTERS

ESTABLISHMENT OF GDR INFORMATICS SOCIETY

General Data Provided

East Berlin MESSEN-STEUEERN-REGELN in German No 1, Jan 86 p 41

On 1 July 1985, the formal founding ceremony of the Society for Informatics of the GDR took place in the Marx-Engels auditorium of the Humboldt University in Berlin. The master-of-ceremonies was Prof Dr M. Peschel, the chairman of the ad hoc committee for the establishment of the Society. Dr H. Fuchs (AdW [Academy of Sciences]/ZKI [Cybernetics and Information Science Central Institute, Berlin-Adlershof]), acting chairman of the WGMA [Scientific-Technological Society for Measuring and Automation Technology] conveyed the greetings of the board of directors of the WGMA.

The important focal areas of the Society were outlined in technical lectures, for example by Prof Dr D. Hammer (AdW) on new computer architectures and by Prof. Dr. F. Wysotzki (AdW) on future tasks of artificial intelligence.

Prof Dr D. Hammer, section leader at the Institute for Informatics and Computer Technology (IIR) of the Academy of Sciences of the GDR was elected for a period of four years as chairman of the Society for Informatics of the GDR at the founding ceremony. At the same time, the board and the directors of the special sections [FS] of the Society were elected:

-Special Section for the Theoretical Foundations of Informatics (Prof Dr H. Thiele/HU [Humboldt University] in Berlin)

-Special Section for Computer Architecture (Prof Dr W. Cimander/TU [Technical University], Dresden)

- Special Section for Software (Prof Dr G. Stiller/AdW/IIR)

- Special Section for Informatics Applications (Prof Dr V. Kempe/AdW/ZKI)

-Special Section for Basic and Advanced Training (Prof Dr I. O. Kerner/PH [Pedagogical College] of Dresden).

The Society for Informatics of the GDR (GIDDR) is subordinated to the Academy

of Sciences; its objective is to support scientific activities and to encourage the exchange of scientific opinion and information and to help to disseminate state-of-the-art knowledge in the broad field of informatics. In addition, the Society will sponsor scientific meetings, consultations and colloquia, support scientific publications in the field of informatics and develop guidelines for basic and advanced training and for education in the schools. Several of these activities will be carried out jointly with the Scientific-Technological Society for Measuring and Automation Technology (WGMA) in the KDT [Chamber of Technology]. The convention INFO 87, which is to take place in 1987, will be one of the next events that directly involve the public.

We wish the GIDDR a successful beginning and effective work.

Subordinate to Academy of Sciences

East Berlin VERMESSUNGSTECHNIK in German No 10, Oct 85 pp 355-356

Only a few days after the important 10th Plenum of the ZK of the SED [Central Committee of the Socialist Unity Party], the formal founding ceremony of the Society for Informatics of the GDR took place in the Marx-Engels auditorium of the Humboldt University of Berlin on 1 July 1985.

The newly-founded Society for Informatics (GI) of the GDR is a scientific society that is subordinated to the Academy of Sciences [AdW] of the GDR. Its purpose is to further the expansion of scientific activity, to foster the exchange of scientific thought and to disseminate the most advanced information and experiences in the area of information processing, a field for which at the present time the term "informatics" has found international acceptance.

The founding ceremony of the GI had been prepared by an ad hoc committee, to which belong leading representatives of the Academy of Sciences of the GDR, of the universities and of the informatics industry. The ceremony opened with an introductory speech by Prof Stiller, vice president of the AdW, who described the societal significance of this founding ceremony. It involved, he pointed out, the creation of a broad basis and the dissemination of comprehensive knowledge of informatics on all levels of basic education, vocational training and professional studies. Prof Auth, vice chancellor of the Humboldt University, noted that informatics as an individual science has been developed on the basis of microelectronics and of mathematics and that it naturally would also generate new impulses for the further development of mathematics and microelectronics. In line with these developments, automated knowledge processing represents a qualitative new developmental stage in the progress of science. Greetings by Prof Kloetzler, chairman of the Mathematical Society of the GDR, and by Prof Fuchs, chairman of the Scientific Society for Measuring Technology and Automation at the KDT, ended the first part of the ceremonies.

In two keynote speeches given by Prof Hammer (AdW) on "Communication in Complex Computer Systems" and by Prof Kochan/Instructor Schaller (TUD) on "Computer-integrated Production Preparation and Implementation," topics

discussed included hardware and software problems of remote computer systems using the example of the OSI reference model, problems of computer communications in local and global computer networks, the stages of integrated manufacturing systems (with automatic communication), as well as the creation of modular control systems with knowledge processing, machine learning and machine intelligence.

Finally, in six short talks given by the recommended leaders of the special scientific sections, current tasks were discussed along with the future profiles of the individual sections, as well as suggestions for the formation of work teams within the special sections.

The special section "Theoretical Foundations of Informatics" (headed by Member of the Academy Prof Thiele, HU Berlin) will focus on the following problems:

- logical and algebraic foundations of programming (logic of algorithms, processes, data flows; formal languages; abstract data types, automated proof of theorems)

- complexity theory (time and memory resources, parallel processing, VLSI problems etc.)

- theory of multi-processor systems, computer networks, remote systems (super computers, VLSI design, Petrie networks, protocol theory, scheduling theory etc.)

- theory of data structures and information systems, automated hardware and software design, VLSI design.

In the special section for "Computer Architecture" (Prof Cimander, TU Dresden), the primary focus is on the further development of microelectronics, the creation of new performance characteristics for multi-processor systems, on the interfacing of computers of different hierarchical stages, the development of integrated special processes, as well as of computers of the fifth generation, in order to solve the problems of knowledge processing (speech, text and image processing). The following teams are to be formed:

- computer architecture

- computer networks

- computer operations.

The work profile of the special group for "Software" (Prof G. Stiller, IIR of the Academy of Sciences) will include the following fields:

- programming languages and translation technology (systems programming languages, technical languages, translating programs, meta-languages etc.)

- information systems (architecture, design, interfaces, implementation of data base/program base systems, data protection etc.)

-software technology (the construction of programs and technologies of programming, language standardization, evaluation of software etc.).

The special section "Informatics Applications" (Academy Member Prof Kemper, ZKI of the AdW) will orient itself to the following areas:

-analog and digital image processing (methodology, technology, applications)

-CAD/CAM systems and computer graphics (basic software, 2-D and 3-D geometric processing, data bases, local computer networks, ergonomics etc.)

-computer-assisted simulation and prognosis (methods and basic software for the modeling of complex systems in planning, management, economics, environmental protection, agriculture and industry; for the simulation and optimization of poly-parametric systems)

-applications in information and expert systems (office automation and personal computers)

The special section for "Artificial Intelligence" (Prof Wysotzki, ZKI of the AdW) will devote itself primarily to the formalizing of cognitive processes (perception, recognition, inferencing, problem-solving) and their simulation on computers and/or with the transmission of partial processes of intellectual achievements to computers. The following teams will devote themselves to these areas:

-speech processing, analysis and synthesis, question-and-answer systems, speech interfacing with data bases etc.

-inference and problem-solving processes (structuring of knowledge bases, acquisition of implicit knowledge by means of deductive inference, automatic learning via inductive inference, expert systems)

-KI [AI = Artificial Intelligence] languages for the representation and recall of knowledge, intelligent dialogue structuring, language hardware

-development of cognitive models before formalizing of cognitive processes via KI [AI].

The special section for "Basic and Advanced Training" (Prof Kerner, PH Dresden) will concern itself with questions of informatics education at all levels of basic schooling, vocational training and professional studies, as well as with the societal impact of educational programs. In this the main focus is on advisory activities for well-established training programs and informatics curricula in the schools (POS/EOS [polytechnical schools/expanded polytechnical schools]), in vocational training as well as at the university level (MHF/MfV [Ministry for University and Technical School Affairs/Ministry for Public Education]).

-informatics in the schools (problems of informatics education and applications in the education and training of teachers, the procurement of teaching materials for the field of informatics for teachers, support of

informatics education and informatics utilization initially in facultative courses in the schools, etc.)

-informatics in vocational training (review of training plans, revision of curricular models with regard to microelectronics and informatics, creation of leadership models of informatics applications in occupational training)

-informatics at the university level (examination of the level of computer-assisted education in all instructional areas, derivation of suggestions for modifications in the plans of study, more precise formulation of descriptions of professions and the creation of new informatics professions)

-computer-assisted learning and teaching (development of the understanding of and enhanced implementation of computers as a teaching tool, an exchange of experience regarding computer implementation and effectiveness, support for informatics training in developing countries).

The broad spectrum of scientific themes in the special sections and working teams of the GI of the GDR make it clear that the informatics industry of the GDR will in the future have competent scientific partners in the specialists of informatics and related disciplines who are brought together in this Society.

In the third portion of the founding ceremony, Prof Peschel (IIR of the AdW) introduced the candidates for the board and the review commission of the GI. The draft of the statute of the GI of the GDR and the subscriptions clause were unanimously approved. The board and the review commission, with 23 and 5 members respectively, were then also elected in open balloting. The constitutive first consultation of the board elected Prof Hammer, Institute for Informatics and Computer Technology of the AdW, Berlin, as chairman of the GIDDR, as well as two deputy chairmen (Prof Cimander, TU Dresden and Dr Bauerfeind, AdW and scientific secretary).

The statute of the GI of the GDR defines the name, seat, allocation and tasks of the Society, its membership (any GDR citizen with completed university or professional studies may become a regular member, the application for membership must be approved by two members of the Society, membership dues are M 25 a year; students may be accepted as special members with annual dues of M 10; any juridical person in the GDR may become a corporate member), the duties and responsibilities of the members, the structure of the Society, the tasks of its organs and of its administrative committees. It is planned that the Informatics Society of the GDR will work in close cooperation with the KDT and other scientific societies. The administrative committees will each be elected for a period of four years. Meetings of the general membership are to be held every two years. A quarterly report will be issued on the scientific activities of the Society. Further inquiries concerning the activities of the Society may be directed to the author of this report (WB Cartography of the TU Dresden: Tel. 463 4809).

VmK 10306. Received 18 July 1985. F. Hoffman.

12792

CSO:2302/12

EAST EUROPE/COMPUTERS

POLAND

ANONYMOUS SPECIALIST DECRIES POLISH COMPUTERIZATION EFFORTS

Poznan WPROST in Polish Feb 86 pp 4-6

[Article: "A Light in the Dark"; interview with an unidentified computer scientist]

[Text] The following interview was conducted with an eminent Polish computer scientist. The interviewee did not agree to authorize his views, even though he did not perceive offenses from the journalist's side. However, because of the importance of the subjects discussed, the editorial staff acknowledged it would be instructive to publish the interview while maintaining the anonymity of the interviewee.

[Question] No doubt computer science is becoming a very popular subject in Poland.

[Answer] Do you have computer games in mind? Of course that is the greatest palliative, an attempt at communion with a world that has left us far behind. But after all computer science is not a compelling economic necessity; it has no internal strength. In Poland, computer science is simply a phenomenon suspended in a vacuum.

[Question] You state that the pitiful state of our computer science is not the result of our national shortcomings or the wrong decisions made by certain individuals responsible for this sector.

[Answer] Absolutely. Placing the blame for our backwardness on the stupidity or ill will of several dozen or even several hundred individuals, whom one can point one's finger at, trivializes the entire problem. I believe that the main reason for such a state of affairs is the lack in our country of any kind of economic prerequisite that would create appropriately strong incentives or at least justify applying computer science in economic activity. Simply stated, the functioning of our economy and its method of management is insensitive to the timely receipt of proper information. In other words we have to contend with a situation where information, though valuable, cannot be implemented in the workplace. After all, what difference does it make, for example, if an optimum time exists to purchase some kind of raw material or semi-finished product if in fact one cannot obtain it? In such a situation I am forced to apply an entirely different logic: purchase the material beforehand and do not

disclose this fact. In Poland the creation of such excessive reserves is in theory resisted. But every buyer knows that it is better to purchase 100 kg of butaprene even if one-half of it will probably be wasted rather than fear constantly that he will be unable to purchase it exactly when it is needed. A buyer figures it is better to suffer even a 50 percent loss than to hold up production. Thus, in general I believe that economics in Poland was and is too sick for those mechanisms to work that have promulgated the growth of information processing and transmission in all the postindustrial countries such that they became an economic priority. After all information is a specific product that is increasingly in demand. In the meantime boundless nonsense is beginning to be voiced in Poland over the last several years and even months! The belief has actually arisen that we will be able to overcome the effects of our backwardness by epidermal activity.

[Question] Those are strong words but a bit too general. Could you provide an example of such thinking?

[Answer] Of course. Right now serious consideration is being given to equipping the Polish Academy of Sciences [PAN] with computers ...

[Question] But this should please you.

[Answer] Except that the purchase of personal computers is favored.

[Question] Such toys for grown children!

[Answer] They are professional machines. However, they are useful for secretaries and not, for example, a physics institute! If one believes that using such computers can produce results similar to those now being obtained in the world in scientific research and basic engineering experiments than that indicates a complete lack of knowledge of computer science.

[Question] Is not that a bit exaggerated?

[Answer] It should be understood that modern scientific institutes are equipped with computers that cost \$10 million and more each. The equipment proposed for our PAN institutes are machines costing \$2,000 to \$3,000, that is at least a thousandfold cheaper. In computer science the statistical, empirical Grosz Law has been valid for years. This law states that a computer's computation power increases as the square of its cost. Therefore, if you have a computer that costs only one-thousand as much then its computation power is one million times weaker! That is why the conviction that our scientists will be able to achieve worldclass results with such equipment can be called nothing less than plain nonsense. In the end we must realize that without proper equipment Polish science and technology will at best vegetate at the periphery of modern civilization. Right now, for example, computer simulations are being conducted all over the world. Simply stated, they are much cheaper to perform than experiments, even in wind tunnels. But large computer power is needed for this, several hundred times as much as that possessed by personal computers. With the stubbornness of a maniac, I continue to return to the theme of large computers because right now too many people in Poland believe that computer science is associated with computer games above all. In the meantime

general use microcomputer equipment represents 10 percent of computer equipment turnovers worldwide. Of course, in sum this represents a lot of money, at least \$10 to 20 billion. This is true; but just as the tip of an iceberg rests on nine-tenths of its mass, which the casual observer does not see, so do microcomputers make no sense without a powerful computer science using professional, large computers.

[Question] But this is nothing new.

[Answer] Well then consider the fact that in the flood of information on computers issued lately by our mass media nothing is being said in general about computers costing \$15 or \$100 million each. Of course in the West the city streets are full of advertisements for microcomputer equipment that are designed to attract the attention of Mr Jones, the English equivalent of our Kowalski. Of course, the microcomputer is aimed toward the average consumer. But the purchase of a Cray computer for \$20 million is done by professionals, who are not influenced by color graphics of half naked women. An entirely different type of advertisement operates here, one understood only by specialists. Unfortunately, during their visits to the West our economists, politicians and often even our scientists succumb to advertisements that are aimed at Mr Jones and his children. Thus they view the computer market in a very distorted way. In addition, and this should not be forgotten, several thousand dollars appears to be a sum that turns the heads of far too many decision makers in Poland. They think that because one can buy a computer for \$100 at any store in the West, then a computer that costs up to \$5,000 must be worthy at least of a Rothschild.

[Question] On the one hand you say that the use of computer science in our economy will not produce direct economic benefits because of the regulations governing our economy. Thus, from our viewpoint, computer science is simply unprofitable. On the other hand you say it is necessary to purchase expensive, modern computers. All in all, is this just another attempt to push some kind of unrealistic program?

[Answer] If we start late in the next stage of the civilizing race, it means that in general we will not be able to participate in this race. As a nation, a continuous impasse can cost us dearly.

[Question] But let us admit honestly that right now it would be economic insanity for us to expand computer science rapidly. This important quote should suffice: "Office computerization in the USA is increasing the annual costs of these offices 5 to 10 percent. Current computer costs means similar office work station computerization in Poland would cost two to three times more than the work station alone ... To achieve the same economic results, a Polish worker would have to be at least 20 times more efficient than his American counterpart, and this is completely impossible."

[Answer] That relation will worsen for us as time goes on. In the end a situation can arise that when a new type civilization--the information civilization-- begins to develop, Poland simply will not be included among those countries shaping this civilization. This will mean that we will lose our national autonomy to a great extent if not completely. Thus, if we want to

avoid civilizing annihilation we must aim in the future in the direction designated by the leading countries of the world.

[Question] Perhaps you exaggerate this problem. After all you view changes in the world mainly from the perspective of your profession.

[Answer] I wish very much that you were right. However, one cannot alter the facts which indicate that right now, as a result of our computer science backwardness, we are losing from year to year more and more in economic contracts with the highly developed countries. Simply stated, the need to defend our interests is now coming into play. Our pocketbooks are being hurt with increasing severity because current information is lacking. For example, right now bank calculations are made in the West in a matter of seconds, which means that we must remit our payments almost immediately, while similar operations in Poland take many weeks. Of course we cannot exact earlier payments from our Western contractors because during this entire time we do not know who owes us money and how much is owed.

[Question] That means it is our fault that interest earned on this money is not being credited to Poland.

[Answer] I could provide many similar examples. But I am deeply disturbed by another phenomenon. For many years it has been obvious that the educational gap between Poland and the postindustrial countries has widened, which right now, unfortunately, is impossible to overcome. More or less at the beginning of the 1970s, the higher schools of the developed countries became completely and thoroughly computerized. This means that the didactic process for many specializations that are important to social life was imbued with computer science, which was not treated as a separate subject but as a working tool. Thus, in this way the number of people in these societies is increasing at an almost overwhelming rate whose computer know-how is considered to matter of fact and needed to perform their jobs. Today in Poland there is not even a single school in which the didactic process is imbued with computer science to a similar degree. Thus, year after year we produce people with masters degrees who are illiterate in computer science in comparison with their colleagues in the developed countries. There are very few professionally trained computer scientists in Poland. Our schools accept about 500 people annually in this field of studies, while a single polytechnic in West Berlin produces 600 professional computer scientists annually. This West Berlin polytechnic is not some kind of an exception. In the developed countries it is the rule.

[Question] But is not such a situation the result of the almost nil demand for computer scientists in our country?

[Answer] Yes. The most ironic thing here is that the NOT [Main Technical Organization] does not recognize the profession of computer scientist to this day. To the NOT, a computer scientist is an electronic engineer specializing in computer science. Our attempts to explain that computer science is not any kind of supplement but a separate technical discipline falls on deaf ears.

[Question] Does one still have to be convinced of this at the end of the 20th Century?

[Answer] In the theses of the Third Congress of Polish Science, the word "computer science" does not appear even one time ...

[Question] If you told this to your colleagues in the FRG or the USA, how would they react?

[Answer] They would think it was a poor joke. Right now most governments in the world have developed programs to expand science and technology. These areas are too important to be left solely to the free marketplace. In these programs, computer science research and development is considered to be one of the main or basic areas of interest of the governments.

[Question] In these countries they already are thinking in terms of the 21st Century.

[Answer] Today increasing numbers of people believe that the world cannot continue to develop at the exceptional and extensive rate of the 19th Century. To build modern economic powers, large amounts of energy and raw materials were used. If India, for example, wanted to take this same path today to achieve the level of industrialization of the United States, it would have to use more energy and raw materials than now exist in the world. Does this mean that the world must always be divided into nations that have become wealthy at the expense of others and nations that are poor? It seems to me that computerizing economic activity and in general all human activity is the way out of the energy-raw materials impasse toward which, according to the fatalists, the world is headed. In this civilization of tomorrow, processing information will become the main and priority economic process, which will be applied to all human social activity.

[Question] Another utopia?

[Answer] If we observe closely the phenomena now going on in the world, it can be seen that the postindustrial countries are but a step away from this realization.

[Question] What will the world be like in the 21st Century?

[Answer] Above all the rise of the information civilization will mark the demise of large cities, which, after all, were built for the needs of industrial civilization. In all probability this will lead to shifting the center of gravity of government from central to local authorities. Great changes will also occur in the forms and norms of community life. Just as industrial civilization required all people to read and write for its development, so too will information civilization require people to know how to use computer equipment and methods. After all, man's communities will be so imbued with this equipment that to function in them normally will not be possible without knowing how to use computer equipment.

[Question] All the same, it seems to me that we have strayed a bit far from earth.

[Answer] Today it is very difficult to live in the postindustrial countries without using credit cards. Vast number of scientists and technicians cannot avail themselves immediately of technical literature without using computer information systems. Here is one more example. No more than 2 weeks ago I received the operating regulations for a certain international committee to which I belong. Among other things i received a card containing the addresses of the committee members. Of course, the regular postal addresses, telexes and telephone numbers were listed. But in addition numbers for the computer information exchange networks were also listed. Thus, the use of electronic mail to contact one another is considered completely normal. But to us it sounds like some kind of science fiction. Of course, right now Polish scientists can still use traditional means to exchange information with their colleagues in the postindustrial countries. But please remember that the situation will change radically when the degree of computerization in these countries becomes such that traditional forms of publishing news will simply cease. Then if we are not prepared to use computerized methods to transmit information then we will be in practice cutoff from knowledge concerning the latest scientific and technological achievements. We will have to use information received second hand, information meant for the second world of computer civilization. I do not have to explain what this will mean. In the end we must realize that the commonwealths will be shaped by information processing. We should not kid ourselves that what I said will not happen for a long time. We are too accustomed to the Polish tempo of scientific and technological progress to understand that the future is much closer than we imagine from our perspective.

[Question] However, let us try to end our interview on an optimistic note.

11899

CSO:2602/32

EAST EUROPE/FACTORY AUTOMATION

ELECTRONIC CONTROL SYSTEMS FOR CSSR MACHINE TOOLS

Prague TECHNICKY TYDENIK in Czech No 13, 25 Mar 86 p 7

[Interview with Engineer Vladimir Vurm, C.Sc., Head of Machine Tools Research at the VUOSO (Research Institute for Machine Tools and Tooling), Prague, by Engineer Bedrich Chodera: "Electronics and Machine Tools: A New Generation of Control Systems Being Created"]

[Text] The March special theme page, "Electronics in Electrical Engineering," is being devoted to those electronic systems and devices for which research and development are being carried out by TST--Research Institute for Machine Tools and Tooling (VUOSO) in Prague. In the course of our visit to this work center, we asked several questions of the Head of Research for Machine Tools, Engineer Vladimir Vurm, C.Sc.

At the present time, in practically all industrially developed countries, a singular developmental trend is appearing which is leading to a complex and flexible automation of machine industry manufacturing based on extensive application of the most modern control and information technology. For this type of automation, the acronym CIM (computer integrated manufacturing) is used. The fundamental component of these flexible manufacturing systems is the highly automated, digitally controlled machine tool.

It is characteristic that, both in the case of individually introduced digitally controlled machine tools (still the most common ones) and particularly in the case of flexible manufacturing systems, the technical level reached and the resulting advantages for the entire society are decisively influenced by the technical and economic parameters of the control technology and electronic automation centers. In order to maintain the quality of our machine tools at a level corresponding to present world development, it is necessary to continue with innovation in control and automation technology.

[Question] What role does the VUOSO play in the research on and development of control systems for machine tools?

[Answer] Research and development projects in the area of digitally controlled machine tools have a tradition of over 25 years' standing in our institute. If we confine ourselves to a short review of the last decade,

the period in question can be divided into several stages. In the first half of the 1970's, our institute came up with concepts for a uniform series of NS hardware control systems, coordinated their development, and significantly participated in research on the majority of systems of this type, ranging from the very simple ones through continuous control systems (for example NS 441 and NS 471). Some of the control systems from that time are still being manufactured, and considering their relatively good degree of reliability they are well liked by users. In the second half of the 1970's, our institute coordinated the beginning of research on and development of the CNC control systems on the basis of 8-bit microprocessors. In this case as well, we participated intensely in the research and development projects on the systems of the NS 500, 600, and 700 type, which at present represent the bulk of the assortment of digital control systems manufactured in the CSSR.

With the creation of the field of the electrotechnical industry, coordinated research activity and the development of control systems for manufacturing machinery were placed under the management of the ZAVT (Plants for Automation and Computer Technology) economic production unit of the Research Institute for Automation Devices (VUAP). For this reason, the VUAP was entrusted with the coordination of the task set forth in the State Plan for the Development of Science and Technology on microelectronic systems for manufacturing machinery, which covered the period from 1982 to 1985. The goal was to develop means for the digital control of a particular assortment of machine tools, forming machines, and textile machines.

That is why this task also included the development of the NURIS type control systems for controlling laths and cutting machines, including those used in machine tool centers. These systems are gradually being developed in four types, designated as NS 730 S, F, SC, and FC. The sponsoring institute is the VUAP, and the manufacturer will be ZPA (Plants for Industrial Automation) in Kosire. Our institute is participating in the development of the program modules for the NC part. The NURIS systems have modular construction, are of the multiprocessor type using 16-bit 8086 microprocessors with an 8087 math coprocessor, have an alphanumeric screen display, and are supposed to be supplied in a largely assembled state.

Another developmental stage of the NURIS system is supposed to be the NS 730 BOS system for the control of unattended machine tools, being developed as part of the state task on unattended machine tools and system solutions for manufacturing technology. This development is being coordinated by our institute, which is solving some of the tasks.

Also, ways and means of adaptive control, active control, and operational diagnostics are an integral part of the control of modern machine tools, particularly unattended machines. The MS-2 measurement sensor for active control of the dimensions of an item being machine tooled and of the position of the tool edge can be used as an example of these research projects. At the Electronization and Automation Fair of 1985, one of the six prototypes of this type of sensor was on display. It was manufactured in 1985 in accordance with our specifications at Someta Teplice and supplied with diagnostic electronics manufactured at our institute. In addition to this

prototype of a sensor with inductive signal transmission, a functional sample of a sensor with signal transmission by infrared rays was also shown at this fair. The total accuracy of the sensor was documented at the installed measurement device. The accuracy was fully comparable with the products of the Renishaw Company, which represents the top of the line in the world in this field. As regards the success of the resulting accuracy tests, these sensors will be manufactured alternatively with inductive transmission as well as with infrared transmission beginning this year.

[Question] Let's go back once again to the control systems. What are you preparing for the less common machine tools?

[Answer] The category of nonstandard control systems includes systems meant for the control of other than lath, cutting, drilling, or boring machines. There are, for example, systems for copying cutters, for automated technological centers to divide piping materials, systems for integrated robots, and manipulators for machine tools, etc. Last year, even in this area we achieved some very good results.

For purposes of controlling copying cutters from TOS Hulin, the functional sample of the NS 590 control system was successfully tested using the FKH 80 machine. Our institute is following up on this research with its development and successive manufacturing at Tesla Kolin. This multi-processor control system uses a full range of processors (8080, 8086, 8048), has an alphanumeric screen display, and final parameters that are fully comparable to those of the systems heretofore imported from abroad. This year our institute will cooperate with TOS Hulin and Tesla Kolin in testing the prototype of the NS 590 system manufactured by Tesla Kolin. Tests of the prototype will be carried out using the FKH 80 A device, which will be replacing the previous FKH 80 and will be the type used for copying cutters for the period of the Eighth 5-Year Plan.

Another control system for which research is only in the initial phase is the system for the control of an automated technological center for the division of piping material (PKA 20 CNC-TP circular saw for metal).

For completion of automated technology centers on the basis of standard CNC machine tools, integrated industrial robots, for example the IPR 8 from the TOS Rakovnik enterprise or the Portal manipulator AM 20 from TOS Hostivar, are suitable. However, the corresponding control system for their control, which will make it possible by a simple means to program individual movements and other functions of a given manipulating device as well as to connect it functionally to the machine tool, is necessary.

While working on the development of the IPR 8 integrated robot, on which we cooperated with TOS Rakovnik in 1984 and 1985, our institute oversaw development of the NS 880 control system, the concept of which is to allow for control of a manipulating device with a maximum number of four continuously controlled coordinates and four coordinates which are with a dual control. The NS 880 control system follows the programmable automatic NS 905 (manufactured by Tesla Kolin), to which some other modules and a

portable programmable instrument for inserting a program using the teach-in method have been added. Because the time frames for the manufacture of the systems NS 880 systems at Tesla Kolin are not synchronized with those for the manufacture of the IPR 8 and AM 20 units, in 1985 at our detached work center in Brno assembled the next ten systems in cooperation with Tesla Kolin. Because Tesla Kolin will once again be unable to meet all the demand for these control systems this year, our work center in Brno will manufacture another 17 of them.

[Question] However, for successful electronization and automation, it is not enough merely to have a good quality control system. The electrical signals must be translated into mechanical motion. . .

[Answer] This function is covered by speed and position servo systems, i.e., regenerating regulation systems, where electrical regulation drives are used as the output components. The regenerating elements are composed of corresponding speed sensors and position sensors; the position regulator is usually a part of the control system.

In the research on the development of electrical regulation drives for feeds and spindles, our institute has been cooperating for more than 10 years with the enterprises of the ZSE (Plants for Strong Current Electrotechnology) economic production unit, mainly with the MEZ (Moravian Electrotechnical Plants) in Brno, MEZ Vsetin, and the Research Institute for Electrical Rotating Machines (VUES) in Brno.

The research projects finished last year showed us the way to solve the adaptation regulators for the feed drives of the Mezomatik K. By overlapping individual stages, we managed to complete the design, testing and introduction into mass production by the fourth quarter in just 1½ years! By using the adaptation regulators, the characteristics of the unidirectional drives with three pulse thyristor convertors were significantly improved, bringing them closer to the characteristics of unidirectional drives with transistorized converters. As yet, the CSSR does not have the efficient transistors required to be able to introduce these step drives.

Another of our institute's contributions to the development of regulation drives for spindles is the successful solving of the positioning unit (which was exhibited by itself at the NSV in 1985). This unit, in conjunction with the converter of the Mezomatik V drive, allows for very quick and accurate stopping of the spindle, which is necessary for a rapid exchange of instruments at the machine tooling centers; in addition, with the help of this unit, the angular position of the spindle may be controlled. In 1986, we want to further develop our research work in the area of alternating regulation drives.

[Question] Electronics can be not only a subject of, but a helper in, research and development. Are you also considering the application of CAD?

[Answer] In the introduction to our discussion, I mentioned the worldwide trend in complex automation (CIM), which includes computer-assisted design

(CAD) and production (CAP). Our institute is active in this area as well, and is preparing several applications. If you come to visit us next year, we will certainly be able to show you many interesting things in this area.

[Question] Thank you for the interview.

[Photograph captions]

1. Spindle positioning unit developed in cooperation with MEZ Vsetin and MEZ Brno.
2. Linear measurement system with a belt linear inductosine.
3. Functional sample of the MS 590 control system designed for the control of copying cutters.
4. Prototype of the NS 880 control system for the control of integrated robots and manipulators.

12993/13046
CSO: 2402/7

EAST EUROPE/LASERS, SENSORS, AND OPTICS

SPECIALISTS DISCUSS LASERS AT GDR MEETING

East Berlin SPECTRUM in German No 2, 1986 pp 15-17

[Text] From 28 October to 1 November [1985], more than 400 scientists from 15 nations met for the Fifth International Conference on Lasers and their Applications. This was an anniversary because exactly 25 years ago, the laser was discovered. SPECTRUM interviewed experts from four countries about the present state of the art and about future applications of the laser.

In the year of the 25th birthday of the laser, scientists in Dresden's City Hall discussed future developments of this "magnificent" phenomenon. One of its fathers, Academy member Nikolai G. Basov, recipient of the Lenin and Nobel prizes, took part in the conference. The meeting was hosted by the Central Institute for Optics and Spectroscopy of the Academy of Sciences of the GDR and the Physics Society of the GDR. It took place under the auspices of the International Commission for Optics.

During the last few years, the uses of lasers have multiplied; the quality of the laser beam has improved. New types came into being, e.g. high-performance excimer lasers with very short wave lengths or lasers that operate in the soft regions of the x-ray spectrum.

This trend has broadened the applications of lasers. In this connection, applications in measuring technology, the processing of materials--especially surface refinement--but also medical applications should be mentioned.

Furthermore, the discussion in Dresden included questions from optoelectronics to image processing and image display as well as telecommunications through optical conductors. In addition, the present situation of laser-induced nuclear fusion was one of the important topics.

Lasers in Cardiology:

Prof Evgenij P. Markin, Lebedev Institute of the Academy of Sciences of the USSR, Moscow

The implementation of lasers in medicine is not a rare occurrence any more; I think this became clear during the Fifth International Conference on Lasers

and their Applications. My own work primarily consists of applications of lasers in cardiology, e.g., in the treatment of ischaemic heart disease and the blocking of the nerve ganglion responsible for the heartbeat. Ischaemic heart disease is present if the heart muscle is supplied with insufficient amounts of blood, a condition that in fact precedes a heart attack. During serious circulatory disturbances and when the coronary arteries are clogged, the localized blockage is bridged by bypass surgery during which a vein of the body is used. At least, this was the case up until now. Surgery of this kind is not only very expensive; moreover, in some cases it is not all that effective. Therefore it was suggested that channels be created in the heart muscle that supply the muscle with blood directly from the heart ventricle. However, these channels, which were formed using the finest needles, constantly closed. The laser provided a solution. Using the right lasers, such as CO₂ or nitrogen lasers, we succeeded in developing an effective method. Animal experiments showed good results. This method will find broad clinical application in the future. An additional heart disease is arrhythmia, i.e., the irregular contraction of the heart at long intervals. In this case--as already mentioned--the appropriate ganglion must be blocked. Until now, one implemented method of surgery has involved "burning out" this ganglion with a supercooled rod with the heart open and its beating stopped. One disadvantage is that heart tissue is destroyed over a relatively large area. We now use a laser based on garnet for the surgery. The laser light is conducted via light conductors into the proximity of the ganglion. It is now blocked without stopping the heart. Then the heart pacemaker can be implanted.

By the way, in the future we want to work without surgical intervention, or better: without cutting, for the creation of channels in the heart muscle as well. It seems possible that the intervention can be carried out here, too, via a catheter with light conductor.

But I foresee additional medical applications for the laser. Success has been achieved e.g., also with the implementation of copper-doped lasers for the purpose of stopping stomach bleeding. The light of these lasers is optimally absorbed by hemoglobin. In this way, stomach bleeding can be very effectively treated with an endoscope. Hard to treat stomach ulcers were relieved after just six to seven treatments.

Other lasers are used to remove polyps. These lasers have a wave length that allows the light to penetrate deeply, up to 15 mm, into the tissue, thereby disrupting the blood supply to the polyps, causing them to die off.

A further possible implementation which is being carried out under the leadership of Prof. Basov himself, is the use of lasers in stomatology in order to treat caries. When diagnosed early, areas of the body that have been recognized as being diseased are vaporized with the help of the laser at temperatures ranging from 1000 to 1200 degrees Celsius. During this process, the temperature inside the tooth rises only by five degrees, however. Therefore, there is no danger of the tooth itself dying.

In the future we intend to use the laser in tumor surgery to treat neurological skin diseases and in the treatment of injuries.

Alternatives to Molecular-Beam Epitaxy:

Corresponding Academy Member Wolfgang Pompe, Central Institute for Solid State Physics and Materials Research, Dresden

If one compares the present conference with that held four years ago in Leipzig, one can note the following: the number of lectures on the topic of materials processing as well as on the topic of refining of materials has clearly risen. I am happy to note that these include an increasing number of contributions from our own Republic. It was also evident that the first industrial applications could now be introduced in the surface refining of carbon steel, an area in which the basic groundwork had already been laid. This involves the surface refining of such large components as crankshafts for diesel locomotives.

Our Institute, together with the industrial sector, has laid the groundwork in materials science and technology for the hardening of selected materials and components through lasers. Applications are anticipated in different combines and enterprises. For example, a laser processing facility in the Cottbus RAW of the Deutsche Reichsbahn will result in extensive benefits through savings in material, an increase in the operational safety of the crankshafts and a reduction in the number of down-days for traction vehicles.

Representatives of the affiliates of the Institute for Physics at the Academy of Sciences of the USSR in Kuibyshev reported on results of materials refining through the implementation of both impulse lasers and continuous-beam lasers. The latter, with outputs of several kilowatts, as well as impulse lasers with outputs of up to a terawatt characterize the state of the art at the present time. It is also interesting, as shown in reports from the GDR and Bulgaria, that a surface treatment of ceramics is also possible with the help of lasers. The growing number of applications in welding and cutting by lasers continue to be a topic of discussion.

Microelectronics is a well-established area for laser applications. At this conference, the possibility of the laser-chemical precipitation of structures from the gas phase was discussed as a new development. It may very well be that these structures will be able to introduce a new aspect into the development of components. There are signs that an alternative to molecular-beam epitaxy may be created with laser technology. However, up until now only preliminary concepts were discussed so that one cannot predict whether this direction will become technically feasible in the near future.

The Triple Correlation:

Professor Adolf Lohmann, Institute for Physics of the University of Erlangen

It is surprising to see how much the laser has already brought forth. This could probably be compared with the development of the transistor. The 25th year of the laser is a proper occasion for an international conference. For

this reason, the description of the historical development of the laser, especially that of the semiconductor laser, which Prof. Barsov gave at the beginning of this conference, was a long overdue introduction that operated at the appropriate level. The lecture given by Prof. Popov of the same institute began at precisely the same point at which the previous lecture had left off. He shed light on the present situation of semiconductor laser physics and the next steps that lie ahead.

The laser has undergone an eventful development. Thus I found the talk given by Dr. Schwider (Central Institute for Optics and Spectroscopy) on optical measuring technology remarkable. During his lecture, it became evident that optical measuring technology can show many interesting results if it is in the hands of an ingenious person. Prof. Walther (Munich) is making an altogether peculiar laser: a laser that makes exclusive use of one single atom or one single molecule. One is allowed to ask: Why that? For such a laser can, of course, not be a very strong laser. But in this way, Prof. Walther obtains the famous "pure" case [study], the isolated experiment. The problem is by no means trivial. There is e.g. the supposition that quantum electrodynamics is only correct in the mean value over many, many single processes. This laser makes it possible to study the single process, which is very important for the basic interpretation of quantum electrodynamics.

My field of work is image processing. We were able to develop the correlation method that had been previously established into the triple correlation method. I was very happy to learn that we received the attention of some laser researchers here. They picked up the concept and they hope that through triple correlation, advances can be made in the study of light impulses of very high frequencies.

Laser-Produced Plasma of High Temperatures:

Professor Slawomir Denus, Institute for Plasma Physics and Laser Microfusion, Warsaw

We work on laser-controlled nuclear fusion. The main direction of our research is on lasers for producing plasma of high temperatures and high pressures. For this purpose, we use in our institute a high-performance, four-channel Neodym laser device as well as a large number of diagnostic devices, e.g., cameras for monitoring high-speed processes. We are also working on producing targets which, filled with deuterium or deuterium-tritium, serve purposes of fusion research. Our institute maintains intensive contact with the Central Institute for Optics and Spectroscopy of the Academy of Sciences of the GDR. We are jointly developing and optimizing a Neodym laser which is being built in the Central Institute for Optics and Spectroscopy.

There are four specialists of laser technology from our institute present at this congress. We are contributing lectures on laser-controlled nuclear fusion as well as lectures on theoretical and experimental aspects of the optimization of high-performance Neodym lasers, to mention just two. I am interested especially in the implementation of the CO₂ lasers, the

construction of ion lasers and new lasers for spectroscopy which can generate high-frequency light impulses for the investigation of the most diverse short-life processes. Thus I am especially impressed by the lecture of Prof. Wilhelmi (Jena). During the last 16 years, microchronometry has undergone rapid development by the construction of laser light sources that emit powerful impulses that can only be measured in microseconds as well as by quantum electronic and non-linear optical measuring designs. Thus it became possible to record chemical and biological processes timed below 10^{-9} seconds all the way down to 10^{-14} seconds directly, which until then were regarded as "unobservably short." In this way, it was possible to gain immediate insight in elementary processes and thus to further develop our theoretic notions of certain process steps as well as compounded processes. Building onto this knowledge, it became possible to influence the course of photo-physical and photo-chemical processes at will. Using very high frequency lasers, it became possible to construct components such as switches, modulators and receivers with an extremely quick response time. These are only a few aspects.

The lecture of Prof. Afanasev (Moscow), in which he discussed perspectives of laser-controlled nuclear fusion, was of very great interest to me. In the area of laser technology, there was also a remarkable contribution by Profs Karlov regarding gas lasers with plasma electrodes.

Five Images Turn into 100:

Professor Jumpei Tsujiuchi, Institute for Technology, Tokyo

At this conference, there was a broad spectrum of contributions concerning the development and implementation of the laser. For a user of lasers such as myself, the development of the laser has been portrayed extraordinarily well. I utilized all the lectures to inform myself about the development in this area during the last few years and to find out about the new results. The topic of my talk is the creation of synthetic holograms. Such a hologram originates from a series of normal photographs taken from different angles. Using a film camera, we shot 1,500 frames of a sculpture, each from a different angle. That means that the camera rotated once around the sculpture. These 1,500 photographs were put together to form one synthetic hologram and were stored on normal film material. Afterwards, the film was formed into a cylinder. If one now introduces a white light source into the cylinder, one gets a three-dimensional view of the object, in this case the sculpture. We hope that this method can constitute an additional step in medical diagnostics, e.g., in the early recognition of cancers, in a certain sense complementary to tomography. For this purpose, we want to portray the body from different angles in three dimensions, using x-ray photographs. If "suspicious" areas are localized for closer scrutiny, the tomograph begins its work. It is, of course, impossible to take over 1,000 x-ray pictures of one patient. We try to restrict ourselves to a few pictures and simulate the missing ones with a computer. We have succeeded in creating 100 photographs from five. This already allows for a good three-dimensional representation of the bodies being examined. Unfortunately, computer time still takes too long (100 hours). But we hope that with further development of this method and improvements in its computerized aspects, an implementation in medicine will

become possible soon. Another area of implementation of these holograms could also be in the education of students, especially in medicine, of course.

Lasers in Lignite Mining

In concluding this poll of international experts, we will describe an example of a practical implementation of the laser in the industry of the GDR.

For the first time, a rotating laser beam is finding industrial implementation in lignite mining. The preconditions for this were created by the laser alignment device LFG1 offered by the VEB Karl Zeiss Jena as well as an optoelectronic light sensor developed and constructed in their own prototype model in the Senftenberg lignite combine. The new acting principle underwent successful practical testing with a bucket-wheel excavator, type SRS 800.

Comparable to a lighting tower, the battery-operated remote control transmitter sets the laser beam in strictly defined vertical, horizontal or circular motion from a higher point at the mining site. Within a distance of up to 500 meters, the laser beam hits the receiver. The receiving sensor, which only weighs five kilograms, is attached (inside a 17 meter-long antenna rod) directly to the bucket-wheel outrigger of the excavator. A light indicator signals to the operator in his cabin the impact of the laser beam. Thus informed, he can, during the lowest cut, raise the bucket wheel, lower it, or have it remain in position.

13139

CSO:2302/13

- END -