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061129

JPRS-EST-86-014

1 AUGUST 1986

Europe Report

SCIENCE AND TECHNOLOGY

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

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EUROPE REPORT
SCIENCE AND TECHNOLOGY

CONTENTS

WEST EUROPE

ADVANCED MATERIALS

UK Syalon: EDM Processed, Withstands 900° C Temperature Range
(VDI NACHRICHTEN, 23 May 86)..... 1

AEROSPACE

Europe May Face Choice Between Supporting Hermes, HOTOL
(Rudolf Metzler; SUEDEDEUTSCHE ZEITUNG, 10 Jun 86)..... 3

FRG Foreign Policy Group Urges Strong Hermes Support
(FRANKFURTER ALLGEMEINE ZEITUNG, 25 Jun 86)..... 5

BIOTECHNOLOGY

Efficient Host-Vector System R&D in France
(BIOFUTUR, Apr 86)..... 8

FRG Details Biotech Safety Guidelines, Lab Registrations
(FRANKFURTER ALLGEMEINE ZEITUNG, 31 May 86)..... 11

Cytogenetic Research on Triticale, Other Grains in FRG
(VDI NACHRICHTEN, 9 May 86)..... 13

Briefs

Built-in Insecticide for Tobacco Plant 14

Research on Artificial Seeds 14

COMPUTERS

British Optical Components Research at Heriot Watt
(Rex Malik; ZERO UN INFORMATIQUE, 7 Apr 86)..... 15

Briefs

 Future French DBMS Program 17

 Birth of French AI Firm 17

 Esprit Computer Project Announced 18

DEFENSE INDUSTRIES

Aerospatiale: Expert System To Diagnose Malfunctions
(Pierre Jovanovic; LE QUOTIDIEN DE PARIS, 4 Jun 86)..... 19

Briefs

 French Military Satellites 21

FACTORY AUTOMATION

French Robotics Projects, International Cooperation Reviewed
(ZERO UN INFORMATIQUE, 21 Apr 86)..... 22

LASERS, SENSORS, AND OPTICS

FRG, French Fiber Optic Radiation Sensors in Silicon Technology
(Joachim Hesse; VDI NACHRICHTEN, 25 Apr 86)..... 24

MICROELECTRONICS

Philips Says Submicron Chip Plants Possible for FRG, U.S.
(C. Krijgsman Interview; NRC HANDELSBLAD, 24 Apr 86).... 27

FRG Research on New Process on Submicron Chip
(FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT,
2 Jun 86)..... 30

European Silicon Structures Up, Running
(Dieter Murawsky; ZERO UN INFORMATIQUE, 28 Apr 86)..... 32

Briefs

 Sycomore VLSI Program 34

 French CNET's Micron CMOS 34

SCIENTIFIC AND INDUSTRIAL POLICY

Election Nullification Paralyzes Scientists at France's CNRS
(LE MONDE, 21, 26 Jun 86)..... 35

Reasons for Effects of Action 35

CNRS Scientists Comment 36

Swiss Participation in Eureka Outlined (Jean-Luc Lederrey; JOURNAL DE GENEVE, 28 Apr 86).....	38
EEC Developing Venture Capital Association (COMPUTERWORLD, 1 Apr 86).....	40
Briefs	
French Venture Capital Activity	42

TECHNOLOGY TRANSFER

MBB's Contract With China, New Products, Cooperation Plans (HANDELSBLATT, 9 Jun 86).....	43
Discussion of New Cocom Lists, French Enforcement Policy (Christian Lamoureux; LE FIGARO, 5 May 86).....	46
French Technology Parks Succeed in Alps, Riviera Regions (VDI NACHRICHTEN, 9 May 86).....	49
Grenoble: Center for S&T, by Pascal Boulrier	49
Riviera Attracts Advanced Technologies, by Pierre Lafitte	51
S&T Parks in FRG: From Concept to Reality (Guenter Keil; HANDELSBLATT, 12 Mar 86).....	55
FRG Military, Civil Research Center: Ammunition, Armor, Plastics (HANDELSBLATT, 26 May 86).....	65
Swiss View Lessons, Risks, Possibilities of Technology Parks (TECHNISCHE RUNDSCHAU, 11 Mar 86).....	66
European Models, Successes, by Juergen Allesch	66
Bern First Technology Project, by Bernhard Mueller	74
Swiss Prerequisites, Special Case, by Hansjurg Mey	76
Briefs	
USSR Buys Minisub From Finland	80

EAST EUROPE

BIOTECHNOLOGY

CSSR Institute Uses Biotechnology To Combat Parasites (Ceske Budejovice; HALO SOBOTA, 5 Apr 86).....	81
---	----

COMPUTERS

Achievements of SzKFP Summarized
(Takacs; FIGYELO, No 22, 29 May 86)..... 84

LASERS, SENSORS, AND OPTICS

Production, Application of Lasers in Bulgaria
(Mira Radeva; TRUD, 17 Apr 86)..... 88

MICROELECTRONICS

Import Restrictions Relaxed; Hungarian Microelectronics Boosted
(Tamas Szonyei; NEPSZABADSAG, 9 Jun 86)..... 92

Hungarian 'Peak' Achievements in Integrated Circuit Production
(Katalin Magos; NEPSZABADSAG, 26 Jun 86)..... 97

SCIENTIFIC AND INDUSTRIAL POLICY

Hungarian Science Academy Responsible for Research Direction
(MAGYAR NEMZET, 10 May 86)..... 100

/12223

WEST EUROPE/ADVANCED MATERIALS

UK SYALON: EDM PROCESSED, WITHSTANDS 900° C TEMPERATURE RANGE

Duesseldorf VDI NACHRICHTEN in German 23 May 86 p 31

[Article by R.H. under "New Materials" rubric: "Electrical Discharge Machining Forms Ceramics: Expanded Applications Through Temperature Change of 900° C As Well"; first paragraph is VDI NACHRICHTEN introduction]

[Text] Duesseldorf, 23 May 86--Besides microelectronics and computerization, an additional high-tech field is moving into the field of vision of production: new materials. There are constant reports of success above all in ceramics. This time, the following example does not come from Japan but from Great Britain.

What most ceramic materials lack is resistance to thermal shocks. But this is indispensable in almost all high-temperature applications to about 1,400 degrees Celsius, because the ceramic components are also subjected to a sharp change of varying high temperatures in process cycles that are repeated hundreds of times consecutively. And now the example: parts from "Syalon" ceramics withstand temperature changes of up to 900° C. The developments were carried out at the research center of the British Lucas group. Scientists at the Max Planck Institute in Stuttgart also took part in the work. The involved firms, Lucas Industries PLC and Cookson PLC, invested equally in the production, development and marketing firm Lucas Cookson Syalon Ltd., Birmingham.

Licenses were issued in the United States and Japan for worldwide marketing. The tool manufacturers Sandvik and Kenametal secured for themselves the market for the metal-cutting processing, the cutting ceramics. In Europe, Lucas produces and markets directly. A Duesseldorf firm is responsible for the German-speaking part of Europe.

What is Syalon? Technical manager Norman Cother: "The four main components of this ceramic alloy family are available on earth in almost unlimited quantities: silicon, aluminum, oxygen and nitrogen. This yields si-al-o-n. We call it Syalon. This is our trade mark." By exchanging aluminum and oxygen atoms with silicon or nitrogen, respectively, in variable magnitude, one obtains materials with defined qualities.

Tools for the extrusion and pulling of metal rods, tubing and wire from nonferrous metals and special steel alloys are secured areas of operations. Molding times are also achieved in the hot-flow pressing of automobile valves.

Other areas of application are TIG welding jets as well as those for the inside welding of the tubes of heat exchangers and center pins for robotized welding operations.

Because it has no tendency to react with the molten material or to "stick," Syalon is also suitable for components in continuous casting and, in powder form, as an additive for refractory products subject to high temperatures.

The next material variant is already nearing introduction into the market--a ceramic that can be processed with electrical discharge machining and that will thereby be economically usable for a considerably larger number of applications.

9746

CSO: 3698/536

WEST EUROPE/AEROSPACE

EUROPE MAY FACE CHOICE BETWEEN SUPPORTING HERMES, HOTOL

Munich SUEDEDEUTSCHE ZEITUNG in German 10 Jun 86 p 4

[Article by Rudolf Metzler: "HOTOL--Competition for Hermes; Europe Cannot Afford Two Space Projects Worth Billions"]

[Text] The decision regarding German participation in the development of the French-planned European Hermes space transporter, announced for fall by Federal Chancellor Helmut Kohl, is not exactly being made lighter by a British counterproposal. Considering that the British were more reticent with respect to the joint European spaceflight efforts in the past, the haste and tenaciousness with which they wish to make their own project palatable to the partners on the continent is surprising. In contrast to Hermes, which is launched with the aid of rocket assistance, they are proposing the HOTOL (Horizontal Takeoff and Landing) space vehicle, the acronym for which betrays its capability of taking off and landing like a conventional aircraft.

British Minister of Technology Geoffrey Pattie only last week knocked on the door in Bonn to introduce the project to the appropriate ministries, as he had done in the other West European capital cities. Currently, Director General Roy Gibson of the newly created British National Space Center (BNSC) is utilizing the forum of the international aviation exposition at Hanover to pass on technical details to specialists. It is likely that Gibson will encounter open ears because he had earned an excellent reputation in key positions with the European Space Agency (ESA) and its predecessor institutions. In the meantime, there were indications from Bonn that Federal Research Minister Heinz Riesenhuber considers the British proposal to be attractive because, like the still more ambitious American project of a suborbital space aircraft, the HOTOL could reach all points on earth within 2 hours and could utilize available infrastructures at airports.

And yet the hurdles facing the realization of such iridescent plans are great. The French boast of the birthright of their technical idea. They see Hermes as the next link in the chain of European spaceflight plans. Launched into space by Ariane, the minishuttle could dock at the European Columbus substation, should the latter ever become a reality in view of the uncertain future of the American space station program. The available equipment is American and lessons are certainly to be learned from the Challenger setback.

On the other hand, HOTOL would mean a half-step, if not an entire step, in a new technical direction. Its propulsion presupposes a yet-to-be-developed hybrid power plant which would utilize oxygen in the earth's atmosphere during takeoff and landing but would have to carry its own oxygen for flight in the thinner layers of the atmosphere. These so-called "scram-jets" have been worked on for years without a solution having been found.

Researchers and technicians cannot provide a generally valid answer to the question as to which of the two spaceflight projects holds the greatest promise and would be most useful to mankind. The decision will have to be made by the politicians, particularly since the costs run into the double-digit billions. What is certain now already is that the Europeans cannot afford Hermes and HOTOL at the same time.

5911

CSO: 3698/526

WEST EUROPE/AEROSPACE

FRG FOREIGN POLICY GROUP URGES STRONG HERMES SUPPORT

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 25 Jun 86 p 2

[Article by K.B.: "The German Society for Foreign Policy Pleads for the Hermes Project: for a 'Strong German Participation,' Strengthening of Europe"]

[Text] Bonn, 24 Jun 86--The research institute of the German Society for Foreign Policy is advising the Federal Government, still undecided in the question of a German participation in the Hermes space project proposed by Paris, to carry out this plan under certain conditions in European cooperation with a strong German participation and substantial financial effort. An analysis and a list of recommendations by a group of experts under the chairmanship of the institute director, Prof Kaiser (University of Cologne), was presented in Bonn on Tuesday. The publication of the memorandum is causing a particular sensation in Bonn, since the Federal Government is involved in difficult deliberations about its future space policy and the European space organization ESA [European Space Agency] faces the fundamental decision of whether to make the French project a joint European activity.

As he told journalists, Federal Research Minister Riesenhuber still thinks that, even under the time pressure now prevailing, there must be a thorough investigation of what Hermes will actually cost and of who is to take part in this project in what way. The Federal Government, he says, is following reasonable timetables. It will decide in the fall whether it will participate in the definition phase of the "Hermes" space glider and the summer of next year it will probably decide on whether to participate in the project.

Kaiser considered it absolutely wrong to view a German participation in Hermes under the narrow aspect of whether or not it could be financed. The discussion in the FRG on astronautics must be carried on without concentrating on the fiscal and economic relationships. It is a matter of the crucial political question of developing a long-term and comprehensive concept for the utilization of space. This utilization is essential for the FRG not only economically and technologically but also in terms of foreign policy, security, development and culture. The group of specialists is calling for a space policy in which Western Europe is understood as a space power of the 21st century. That should not mean the termination of the cooperation between Europeans and Americans. This cooperation is absolutely necessary, says

Kaiser, but as partners the Europeans would not be taken seriously in the United States until they can demonstrate their own capabilities in astronautics. For the authors of the study, that means European autonomy in astronautics. This autonomy, according to Kaiser, must not be a copy of the American and Soviet space activities.

For Western Europe, the report calls for an association of the national space programs within the ESA, in addition to the Hermes program a European participation in an international space station similar to that planned by Washington, the development of its own manned station and own space transport systems for manned and unmanned space travel, the further development of the Ariane booster rocket and the establishment of new transport systems. In addition, a European satellite for reconnaissance and the monitoring of arms control agreements should be launched under the control of the West European Union. Europe must have its own eye in space, said Kaiser. Only united can Europe play a role in space. To be sure, the precondition for this is for the national activities to be developed and expanded.

The report therefore calls for the FRG to develop its own space policy as a supporting element of European autonomy. The memorandum calls for an FRG participation of at least 30 percent under the condition that the collaboration and right of codetermination of the FRG correspond to its political and economic weight, that Hermes be a clearly European project, and that the scientific, technical and industrial capacity of the Germans be used appropriately in Hermes.

Most of the specialists consider the Federal Government's financing of astronautics with DM870 billion last year and the medium-term space budget of DM1.6 billion for the Ministry of Research and Technology to be inadequate. The Research Ministry and other ministries must be provided additional financial resources for the utilization of space. The financing cannot be covered through a reshuffling of the research budget.

The working group for the space report included experts from the parliamentary groups, the coalition and the SPD, from the Bonn ministries, industry, the DGB and science. Among the coauthors are Ruehl, the undersecretary of the federal defense minister, and Stavenhagen, the state minister of the foreign ministry. And ministerial director Finke, who has meanwhile been temporarily suspended by Research Minister Riesenhuber because of differences of opinion about space policy, is also responsible for the memorandum. DGB board member Bleicher and SPD members of parliament Fischer (Homburg) and Klejdzinski have clearly distanced themselves from the majority opinion in important questions. Bleicher considers it too costly to achieve the desired innovation and technological advances through the indirect route of prestige projects in space technology. Bleicher wants to have the development of German space activities examined from the viewpoint of whether other open questions such as mass unemployment, health protection, improvement of the quality of life, and

environmental protection ought to be resolved first. A decision on the future space policy should be made only after a careful and differentiated evaluation of the consequences of technology, Bleicher demanded. The two SPD representatives failed to find in the report a well-founded analysis of why activities in space are to be financed increasingly through taxes and of the extent to which the FRG can allow itself to do that.

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CSO: 3698/542

WEST EUROPE/BIO TECHNOLOGY

EFFICIENT HOST-VECTOR SYSTEM R&D IN FRANCE

Paris BIOFUTUR in French Apr 86 p 63

[Article: "Establishing an Efficient Host-Vector Pair Research Program]

[Text] "The examination of microorganisms used in genetic engineering immediately discloses the fact that each presents one or more of the properties desired by manufacturers, but that none possesses them all. E. coli is productivity champion, but B. subtilis is a good candidate for excretion, whereas some yeasts present unquestionable advantages with respect to ease of industrial cultivation. Would it be possible to obtain a microorganism presenting all of these merits, or at least one which comes near to the industrial ideal?"

"One must no longer consider only the microorganism, or the host, but also the appropriate vector which permits the necessary genetic introduction. That is why one must speak of the 'host-vector' pair....."

"The objective is so important but so difficult to reach that it would be very useful to combine abilities. Can we succeed alone at the national level....?"

Such were the thoughts expressed by Mr Gerard Nomine (Footnote 1) (The current president of ORGANIBIO, the National Interprofessional Organization of Bioindustries, 52 rue du Faubourg Saint-Honore, 75008 Paris) in the May 1984 issue of BIOFUTUR. The time for action has now arrived. As a matter of fact, a multilaboratory research program entitled "Efficient Host-Vector Pairs (CHVP)" has just been set up by seven French bioindustrialists: Cayla Laboratory, Merieux Institute, Orsan, Rhone-Poulenc, Roquette, Roussel Uclaf, and Transgene. Its objective is to develop several host-vector pairs adapted to the reasonably economic production of heterologous protein with bacillus subtilis, streptomycetes, corynebacteria, yeasts, and animal cells.

Each subject is to be administered by a work group directed by a manufacturer. Research will be carried out cooperatively by several public and private research laboratories. As soon as notification is received that the Ministry of Research and Technology [MRT] will participate financially, the 13

laboratories retained and grouped into eight projects will begin the initial work phase. The biomanufacturers who conduct the program will share the remaining cost by paying Fr 400,000 each per year for 3 years.

But with so many manufacturers and public laboratories involved in the same venture, it was necessary to establish "game rules" (see box): What must be contributed by manufacturers and public laboratories who will participate in the program, what benefits will they be able to enjoy, and, especially, how will the patent rights on the findings be distributed? In particular, these rules stipulate that a firm which has not collaborated in the program can only have access to the results after a period of 3 years. Also, if an industrial company wants to participate, there is still time for it to express its interest. The deadline has been set at 1 May 1986. (Footnote 2) (For further information call the ORGANIBIO secretariat (47.67.40.00 extension 5506) before 1 May 1986) It is obvious that the magnitude of the program in its successive stages will depend on the extent of industrial participation, which is hoped to be the greatest possible, considering the necessity to unite and mobilize our forces in order to implement our basic know-how in genetic engineering.

We thank ORGANIBIO for all the details concerning this program.

[Box, p 63]

Regulations

I. The manufacturers participating in the program will provide:

1. An annual financial contribution determined by sharing 50 percent of the program's annual national cost, or a contribution in kind by bearing 50 percent of program expenses incurred in their laboratories.

The manufacturers must commit themselves to ensure this financial support for 3 years on the basis of the program submitted to the MRT on 30 November 1985.

2. Earlier findings, to which they retain the right of free access, as needed for the program's successful completion. These earlier findings will be specified at the beginning of the program by the parties concerned.

It is understood that participating manufacturers will not be compelled to supply findings which involve other public laboratories not participating in the program, or even irrelevant findings of a public laboratory working on the same project.

3. The recommendations and advice necessary to determine the objectives and the follow-up of the program.

In return the participating manufacturers will benefit from the following advantages:

1. Determination of program objectives.

2. Subject administration: Each subject will be directed by a work group led by a manufacturer and composed of all participating manufacturers involved with that subject, with the assistance of a top-level scientific adviser.

3. Scientific follow-up. Each year a conference held behind close doors will bring together all the program's industrial and scientific participants to report and discuss the findings.

Those responsible for each subject will ensure that adequate written reports are compiled for this occasion, and that the scientific knowledge acquired by all involved is thus communicated to all participants without delay.

4. Concrete patentable findings (host-vector pairs) will be protected at the work group's request by a patent prepared and registered by the research organization concerned. That organization will provide the initial registration expenses. The question of registration abroad will be put to manufacturers in the program, and those affected will bear the cost.

5. The concrete findings (host-vector pairs) will be put at the disposal of the manufacturers who participated in the program upon payment of fair royalties to the laboratories involved. Considering the preliminary character of the program, it would appear appropriate to use a rate of about 1 to 2 percent, calculated on the new turnover generated by implementing a hostvector pair developed by the program. But in any case, this rate will have to take into account the specificity of the product and the economic environment.

In exceptional cases findings can be licensed to manufacturers who have not participated in the program, but only 3 years after the manufacturers in the program. In the event that none of the participating manufacturers applies for the license of a specific finding, the work group could decide to grant immediate license to a third party. The royalty rates for third parties will be higher.

II. Public laboratories participating in the program will provide:

-Their know-how and knowledge of the subject.

In return they will receive:

-Reimbursement of their operating costs;

-Researcher grants when necessary;

-The scientific knowledge acquired by all program participant (cf. scientific conference held behind closed doors);

-A fair remuneration for their contribution.

As usual, any scientific publications will be subject to the approval of the work group in charge of that topic. However, that group will not be able to defer publication beyond the required period stipulated by patent regulations.

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CSO: 3698/A134

WEST EUROPE/BIO TECHNOLOGY

FRG DETAILS BIOTECH SAFETY GUIDELINES, LAB REGISTRATIONS

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 31 May 86 p 6

[Text] The safety guidelines for genetic experiments have been altered now for the fourth time. In areas where, according to today's knowledge, the risks are slight, the guidelines are being relaxed. In other areas they are being tightened up and their applicability is being expanded. Federal research minister Riesenhuber, whose report was approved by the cabinet, referred to the progress made in scientific findings which today permit a more precise estimate of the risk potential, allow safety to be better judged, and, thus, safeguard genetic work better than was the case thus far. Nevertheless, safety research is being continued. Investigations with regard to the release of genetically altered organisms and the incidence of pathogenesis and infection have been particularly promoted by the Ministry of Research. The "Guidelines To Protect Against Dangers Caused by in Vitro Recombined Nucleic Acids" were issued for the first time in 1978.

Experiments involving nonpathogenic organisms--in other words, organisms which cause no disease--are virtually free of risk. They will in future not have to be subject to the expensive individual testing by the Central Commission for Biological Safety. On the other hand, all genetic laboratories will have to be registered with the Federal Ministry of Health. The Federal Ministry of Health is currently examining the possibilities of introducing this registration obligation by way of an immediate law.

The guidelines are only binding for projects and installations promoted by the Federal Government; with respect to university-type research, the guidelines are taken over by the various laender; industrial associations have volunteered to adhere to the guidelines. In order to create a calculable planning basis for the industrial use of genetically altered organisms and in order to provide the approving authorities with a uniform basis for evaluation, the guidelines for this area also now foresee detailed safety measures which are oriented toward the international criteria worked out by the OECD. They bear on work involving genetically altered organisms in volumes of more than 10 liters and follow existing laboratory safety measures.

Risk-involving experiments are classified into four groups in the new genetic guidelines. The first group includes experiments which no longer need to be registered and subjected to individual examination, but which must be undertaken in registered laboratories. Safety tests and approval of the Central Commission for Biological Safety are required for experiments with pathogenic organisms and organisms which create toxic substances. With respect to the third group, additional approval must be obtained from the Federal Office of Health. This group involves work with large volumes of more than 10 liters--in other words, industrial production--as well as genetic therapy through genetic transfer of human cells, for which additional consultation and approval by the local ethics commission is required. The medical reasons for such therapeutic measures must be thoroughly documented in a detailed opinion.

Transfer of genetic material into human cells is absolutely prohibited. With respect to other experiments in the fourth group, the Federal Ministry of Health can, in justified cases, grant exceptions. This is also true for the release of genetically altered organisms into the environment, for example, for purposes of protecting useful plants against frost. Criteria for this kind of work cannot yet be adopted into the amended guidelines because the risk cannot yet be reliably estimated scientifically.

Whereas the guidelines have thus far dealt with the protection of life and health of man, animals, and plants, the environment is now also being included as a protective goal. The catalogue of responsibilities of an operator of a genetic laboratory is also new. An operator is responsible for the appointment of project leaders and persons overseeing the biological safety or the appointment of committees, as well as being responsible for seeing to it that genetic work is not initiated until the laboratory is registered, seeing to it that the recommendations of the Federal Ministry of Health are applied and that an inspection of the laboratory is facilitated.

In speaking of the passage of the guidelines, Riesenhuber stated that they created the basis for the chance to utilize genetics and to master its risks. Additional legal regulations are to be investigated. They will also take into account the results of the Bundesstag Commission of Inquiry which is said to be in agreement with the amended guidelines.

5911

CSO: 3698/479

WEST EUROPE/BIOTECHNOLOGY

CYTOGENETIC RESEARCH ON TRITICALE, OTHER GRAINS IN FRG

Duesseldorf VDI NACHRICHTEN in German 9 May 86 p 41

[Text] The Hohenheim research program entitled "Biotechnology and Plant Breeding--Applied Genetics in the Service of World Nutrition" recently reported on the results of its research activities. The facility has been in operation since the beginning of 1985. Its goal is to contribute to improving world nutrition by using genetic technology, cell biology, and classical methods of applied genetics. It endeavors to do so by developing more efficient methods and new genetic starting variations for the breeding of high-yielding, disease-resistant, stress-tolerant plant varieties which have nutritionally-physiologically valuable characteristics. The project was facilitated by a long-term financial arrangement provided by the private Eiselen Foundation.

Considerable successes were already achieved. The genetic working group was successful in transplanting a gene which was of bacterial origin into a petunia plant with the aid of pollen. This experiment which was successful for the first time in this country opens entirely new paths in the area of plant breeding for genetic improvement, since such important plants as grain varieties have thus far not been accessible to genetic technology.

Important findings have also been made in triticale research. Triticale is a new kind of robust grain variety having high productivity, particularly in areas where conditions are unfavorable, which has been created through artificial bastardization of wheat and rye. The scientists at Hohenheim proved, through cytogenetic analyses, that the frequently observed disruptions in fertility and grain formation are attributable to special characteristics in the chromosome design of the rye parent. The Hohenheim project is also pursuing the genetic improvement of disease resistance. Instead of using a single gene which has complete resistance, resistance sources are being used which are controlled by a multitude of genes, each having a small effect. It is hoped that these resistance sources will demonstrate greater persistence, since the parasite would have to undergo an appropriately large number of genetic alterations in order to overcome them.

Investigations are also under way with respect to conserving technical nitrogen through association between grain and bacteria, efforts to increase the protein content and the protein value of corn and barley, efforts to improve the nutrient acquisition capability of grain-containing pulses, efforts to adapt durum wheat to the shorter periods of daylight in subtropical areas, as well as efforts to increase the germination and field growth of seed grain under conditions of unfavorable moisture supply.

WEST EUROPE/BIOTECHNOLOGY

BRIEFS

BUILT-IN INSECTICIDE FOR TOBACCO PLANT--The Belgian biotechnology firm Plant Genetic Systems has developed a tobacco species that kills insects living on it. Researchers took a gene from the bacterium *Bacillus thuringiensis* and put it in the cells of the tobacco plant. The gene produces a chemical substance that is toxic to insects, but not to other animals. For this reason, the bacterium in question is often used as a "natural" insecticide. Plants provided with the bacterial gene also produce the toxic substance that kills hornworms that live by eating tobacco leaves. In addition, the insect poison is "inherited." Seeds from the treated plants also contain the poison-producing bacterial gene. Researchers are now working to develop more insecticidal plant species, especially crops that are not used as food, such as cotton plants. [Text] [Stockholm NY TEKNIK in Swedish 29 May 86 p 6] 9336

RESEARCH ON ARTIFICIAL SEEDS--Research on artificial seeds is now being conducted in the United States and Japan. This is not primarily research for companies, however. Sweden has no such research underway and none is planned. But the plant-breeding firm Hillehog in Landskrona has expressed interest in participating in a project within the joint European research program Eureka in the field of artificial seeds. Hillehog is still waiting, however, since Swedish Eureka companies receive no government subsidies while, for example, French companies are receiving 5 million francs (equal to 5 million kronor) this year alone for research on artificial seeds. Professor Chris Bornman of Hillehog has followed developments in the area of artificial seeds on behalf of the company. He is neither an optimist nor a pessimist with regard to the prospects of developing artificial seeds. "But," he said, "considering developments in molecular biology and gene technology during the past 5 years, you have to be cautious when speaking about what could happen during the next 10 years." [Excerpts] [Stockholm NY TEKNIK in Swedish 29 May 86 p 34] 9336

CSO: 3698/505

WEST EUROPE/COMPUTERS

BRITISH OPTICAL COMPONENTS RESEARCH AT HERIOT WATT

Paris ZERO UN INFORMATIQUE in French 7 Apr 86 p 68

[Article by Rex Malik: "Scotland in the Lead in Star Wars"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Excerpts] Optical components are reportedly the key elements in the American SDI project. The most advanced research in that field is currently conducted in Edinburgh, Scotland.

"If you remove your glasses, you will see a blurred image. Electronics could be used to correct that. However, a simple lens can clear your field of vision immediately. Optics have considerable potential for parallel processing." That is the way Bryan Wherrett begins his conferences on optical computing, a mysterious discipline in search of a technology.

Bryan Wherrett, researcher at the Heriot Watt University (in Edinburgh, Scotland) is reportedly one of the most advanced in his field. He has supervised the design and development of several optical components, whose mass production should increase prospects for optical computation applications. In fact he is one of the very few who have designed an optical computation component which really works.

This component was presented to the public at the latest Hannover Fair. Bryan Wherrett, too prudent to give the date when a tested technology may become available, confirms that the optical approach allows one to envisage computers with SIMD (Single Instruction Multiple Data) architecture. SIMD is a parallel architecture and optical computing is parallel by nature. But SIMD architecture is not the only possibility for optical technology.

From Researchers' Hypotheses to Economic and Political Requirements: A Narrow Margin

All of the above points to a hypothetical future because, although existing optical circuits are able to carry out simple calculations, the "all-optical" optical computer with circuits, switches, amplifiers, and optical memories cannot be produced in view of the fact that some of its components still exist only on paper.

There is however one exception: It is at the Physics Department of Heriot Watt University in Edinburgh, where Bryan Wherrett is one of the key figures in a team of physicists specializing in lasers and semiconductors. Under the guidance of Prof Desmond Smith, director of a European research project involving universities of the FRG, Belgium, France, and Italy (Footnote 1) (the EJOB project: European Joint Optical Bistability Project; the French university participating in EJOB is the Louis Pasteur University of Strasbourg), this research remains very theoretical except at Heriot Watt University. In the area of practical technology, the team there has become the undisputed world leader.

Parallelism Is an Indispensable Component in Visual Reconnaissance Systems

Bryan Wherrett is studying an optical solution to accelerate the processing of digital images transmitted by Landsat satellites. In effect, the faster the reconnaissance, the more time there is to make a decision. This is crucial in the case of Star Wars.

What are the other advantages of optical technology? According to Bryan Wherrett, because of its three-dimensional connections, optical technology avoids the complex interconnection problems of two-dimensional electronic technology.

There is more. The properties of optical circuits allow considerable reduction in the number of gates: For an ordinary addition, a single gate will replace the 14 gates needed in electronic technology. Why? Because the AND and OR functions can be performed by one gate; they are signals which are not physically materialized. In addition, optical technology is capable of diffracting, manipulating, and cascading a laser beam to permit processing speed of the light.

This is no longer data processing as it has been known. Professor Smith has stated: "This approach is totally different. It is no longer a question of whether optical technology is capable of performing a specific function as well as electronics which, after all, has developed over a period of more than 70 years. It is necessary to recall one thing: arriving the right moment is the crucial factor for a new technology."

For satellites and Star Wars, optical computation research has arrived in the nick of time.

25044/12951
CSO: 3698/A124

WEST EUROPE/COMPUTERS

BRIEFS

FUTURE FRENCH DBMS PROGRAM--BD-3 [Database 3] forms part of the joint research programs launched by the Ministry of Research and Technology [MRT] in 1985. The program's objectives are function determination, development of methods and algorithms, construction, experimentation, and evaluation of prototypes of Database Management Systems [DBMS]. In brief, BD-3 has to design and develop future generation DBMS systems. Endowed with a Fr 5-million annual budget from the MRT, BD-3 unites 80 "researcher equivalents" in 18 research laboratories. George Gardarin, professor at the University of Paris VI and scientific adviser at INRIA [National Institute for Research on Data Processing and Automation], oversees research coordination along with Michell Scholl (INRIA). BD-3 is divided into four groups: [1] Multimedia databases, person responsible: Michel Adiba (LGI [International Geophysics Laboratory], Grenoble); [2] Deductive databases, person responsible: Robert Demolombe (CERT [Toulouse Study and Research Center], Toulouse); [3] Database architectures, person responsible: Jean Rohmer (Bull Research Center, Louveciennes); [4] Interfaces between users and databases, person responsible: Colette Roland (University of Paris I). A scientific committee led by Claude Delobel (University of Paris Orsay) is in charge of BD-3 research. This committee consists of some 20 researchers and industrialists. [Text] [Paris ZERO UN INFORMATIQUE in French 24 Mar 1986 p 60] 25026/9435

BIRTH OF FRENCH AI FIRM--It is constantly said that it is difficult for a French research team to establish a company. Here is an exception to the rule: Last June, database researchers set up INFOSYS, a limited liability company with a capital of Fr 210,000. Directed by Yves Barbier, INFOSYS is the result of a meeting of 10 information systems experts who all have directly or indirectly taken part in the SABRE research project developed at INRIA and at Pierre and Marie Curie University. INFOSYS intends to conduct its activities along two lines: [The first one involves] activities similar to those of data processing services and engineering companies, where theoretical and practical knowledge about the whole of DBMS technology will be put to profit consulting selection and development assignments regarding information systems. Moreover, INFOSYS experts have developed a methodology adapted to new-generation DBMS systems which enable fast, flexible, and open-ended development of the conceptual framework for every type of application. This methodology is based on the heuristics underlying SECSI (Expert System for Designing Information Systems). INFOSYS customers already include RATP [Autonomous Authority for Paris Transport], EDF [French Electricity Company], and SAGEM [Company for General Electricity and Mechanics Applications]. [The

second line concerns] product development and marketing activities. With its industrial partners INFOSYS has drawn up a development plan for an industrial DBMS based on SABRINA and for a relational DBMS resulting from the SABRE project. Finally, SECI will reportedly be developed in a commercial version for the IBM PC. Interfaces will be developed with data glossaries from different DBMS's, that of SABRE among others. [Text] [Paris ZERO UN INFORMATIQUE in French 24 Mar 86 p 60] 25026/9435

ESPRIT COMPUTER PROJECT ANNOUNCED--Amsterdam--Within the framework of the ESPRIT program, James Martin Associates, together with four international institutes, has received an assignment for a project called Rubric. Rubric is a subproject which has to establish rules to be applied to the design of information systems intended for applications control. Thus, programmers and analysts will become redundant. This 4-year project, is led by James Martin. In addition to general management, the firm is heavily involved in the conceptual design of the databank. An obvious role is attributed to the application of aids based on artificial intelligence. Other participants are Micro Focus Ltd from Newbury, the Institute of Science and Technology of the University of Manchester, the Belgian Institute for Management, and the Electricity Supply Board in Dublin. Rubric's total cost amounts to more than 6 million guilders, to which ESPRIT contributes more than 2.7 million. [Excerpt] [Amsterdam COMPUTERWORLD in Dutch 1 Apr 86 p 3] 25033/12948

CSO: 3698/A115

WEST EUROPE/DEFENSE INDUSTRIES

AEROSPATIALE: EXPERT SYSTEM TO DIAGNOSE MALFUNCTIONS

Paris LE QUOTIDIEN DE PARIS in French 4 Jun 86 p 12

[Article by Pierre Jovanovic]

[Text] Aerospatiale is stepping into the era of artificial intelligence. Its engineers have developed a formidable expert system for the detection of fighter-borne missile launcher malfunctions.

The missile launcher (ML) is the interface between the airplane and the missile. It is the missile launcher that monitors the state of the missile during flight, makes the decision to eject in case of trouble and receives firing instructions and target data. It is composed of 20 sensitive components--electronic, computer, electromechanical as well as pyrotechnical. As with all electronic equipment, however, detection of malfunctions is extremely time-consuming.

Aerospatiale has developed an expert system operating on a simple IBM PC which locates the malfunction with the help of a print-out supplied by the missile launcher ground check-out equipment. The PC asks questions in French and answers must be given in figures or with a "yes or no". The program is based on 80 rules describing the proper functioning of missile launchers, possible malfunctions and handling errors. Aerospatiale missile division engineers have reduced the rate of non-identification by two-thirds compared with results using classic ground check-out equipment--thereby multiplying the cases of identification by three! This is an extraordinary saving of time in the field of industrial diagnosis. The software program was installed on a GRID Case, IBM PC compatible, thus improving the expert system's portability.

The process operates in the following manner. A malfunction is normally detected after four or five questions. However, when the expert system curtly states: "Unable to respond", the diagnosis is ordinarily carried out by engineers, and when the reasons for the malfunction are discovered, the diagnosis is entered into the expert system. In this way, its knowledge is enriched by a new malfunction combination. In the long run, the computer's expertise is far superior to man's. This is how the situation evolves.

Aerospatiale is counting on artificial intelligence techniques to improve its competitiveness in the world market. The "airplanes" division is conducting a considerable research effort in the field of aircraft-borne expert systems. Among other things, engineers are readying an expert system for maintenance of future Airbuses and another expert system is being prepared as part of the European ESPRIT (European Strategic Program for research on information technology) operation on airplane technical literature, which is constantly evolving: 30 percent of the 120,000 pages of Airbus literature was revised at the end of the first year, 25 percent at the end of the second year and 10 percent at the end of the third. Artificial intelligence specialists will need to design an expert system capable of managing these pages, intelligently incorporating revisions and allowing rapid and, above all, interactive consultation. An ambitious project which should get under way at the beginning of 1987.

In the helicopters division, it is the "quality" department that is preparing an expert system. A division official explains that "The experience we've acquired enabled us to define product quality control rules for helicopter part materials, machining methods, tempering or surface treatments, aged-and-welded treatments, surface hardening, coating with special materials, etc. The expert system will allow us to assemble all these elements and move on to a totally automated process, without human intervention".

With this kind of research effort in the field, France is today one of the front-runners among the leading countries in artificial intelligence--and Aerospatiale is surely preparing an AI program for guiding missiles in its research centers. An intelligent missile is one capable of distinguishing . . . antimissile decoys, which will put an end to the "decoy" war and other electronic countermeasures.

9825

CSO: 3698/524

WEST EUROPE/DEFENSE INDUSTRIES

BRIEFS

FRENCH MILITARY SATELLITES--Long-distance communications for the French military will be guaranteed from now on by the Syracuse network which uses a space segment consisting of two relays installed aboard Telecom 1 satellites. The first station in France, the control station of the network delivered in November 1985, has been established in Brest. By mid-1987, 20 Naval offices as well as approximately 15 transportable or tactical stations will be able to communicate via Telecom 1 with the series of fixed stations in France. Under contract with STEI, an organization of the General Delegation for Armament, Alcatel-Thomson Espace is responsible for defining the system and is the prime contractor for all the ground stations. Bearing in mind the satellites' life span, it may be noted that basic research on the second-generation Syracuse II network has already started in order to guarantee continued service after the year 1990. [Text] [Paris ZERO UN INFORMATIQUE in French 7 Apr 86 p 74] 25044

/12951

CSO: 3698/A124

WEST EUROPE/FACTORY AUTOMATION

FRENCH ROBOTICS PROJECTS, INTERNATIONAL COOPERATION REVIEWED

Paris ZERO UN INFORMATIQUE in French 21 Apr 86 p 6

[Article signed P.L.: "A First Review of the RAM Program"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] Launched in 1984 with overtones of international cooperation, the RAM (Autonomous Multiservice Robots) robotics program in France is focusing on efforts towards marketing competitive robots. Furthermore, the MRT [Ministry of Research and Technology] is talking of launching the new PRISM program.

The RAM program is one of the 18 projects established by the "Technology, Growth, and Employment" working group which was set up by decision of the heads of state and government at the Versailles summit of June 1982. This program was assessed for the first time last week, 2 years after its official launching.

It should be remembered that since 1984 this advanced robotics project has aimed at developing a policy of international cooperation, with Japan and France leading the way. Canada, the United States, the UK, Italy, and the FRG are also involved in the RAM program. Has this policy worked? According to Michel Feldmann (CESTA [Research Center for Advanced Systems and Technologies]), the French coordinator, there has been effective cooperation in research and the exchange of know-how. He points out in this connection that joint experimental centers are to be set up in the United States (Massachusetts Institute of Technology), in France (CEA [Atomic Energy Commission] and CERCHAR [French Coal Mining Research Center]), in the FRG, and in Italy. However, at the industrial level, the different partners have not yet divided the world market for tomorrow's robotics. Will they do so one day?

At present, competition would still seem to have the upper hand. For French manufacturers involved in the RAM project, it is a question of supplying cheaper robots than the Japanese, and in the shortest possible time. This is why, in France at least, the RAM program is directing its efforts toward the short-term development of high-performance prototypes.

Five pilot projects were submitted to CESTA last week. Most of them cover the major topics identified when the program was launched in 1984. In the mining robot field, CERCHAR is developing a robot prototype intended for excavating

ore. Research focuses on the machine's remote control systems and on troubleshooting machine breadkdowns. This project, financed by the MRT [Ministry of Research and Technology], has an overall budget of Fr 40 million and should conclude in 1989 with the development of a mining robot.

For its part, Midi-Robots is the prime contractor on a project for industrial cleaning robots. The Urbaine de Travaux [Municipal Works], the RATP [Autonomous Authority for Paris Transport], and the Generale des Eaux [Water Board], are already interested in these machines, which should be ready by 1987, for use in the Paris subway. The project is financed by ADI [Data Processing Agency].

A Robot Designed to Serve Machine Tools

The I2L company is designing an autonomous robot capable of working on an assembly line. Financed by DIELI [Directorate of the Electronics and Data Processing Industries] and with a Fr 50 million budget, this project should result in prototypes designed to serve machine tools as of 1987.

As for agricultural robotics, the emphasis seems to be on CEMAGREF [National Center for Agricultural Mechanization and Engineering and for Water and Forestry], which coordinates the MAGALI projects for the automated picking of soft fruits, and BREF, a robotized arm for forest clearing.

This research is financed by the MRT, the Ministry of Agriculture, and regional authorities.

Finally, the CEA is working on the development of robots for work in hostile environments. In particular, a mobile platform that can get past obstacles is being studied.

This project is financed by reprogramming funds within the CEA, by the MRT, and by DIELI.

Given the ministerial changes and the fact that the MRT is already talking of launching the new PRISM (Computer-Integrated Manufacturing, Robotics, Systems and Machine Intelligence) program, manufacturers involved in the RAM program wonder if they will receive the public funds needed in the future to bring their projects to a successful conclusion?

25042/12951
CSO: 3698/A133

WEST EUROPE/LASERS, SENSORS, AND OPTICS

FRG, FRENCH FIBER OPTIC RADIATION SENSORS IN SILICON TECHNOLOGY

Duesseldorf VDI NACHRICHTEN in German 25 Apr 86 p 25

[Article by Joachim Hesse: "Fiber Optic Sensors of Increasing Interest--Radiation Detectors in Silicon Technology Are Classic Components of Optical Electronics"]

[Text] In automated processing and fabrication control, measuring equipment is taking on key functions. In many cases the use of measuring processes which do not come into contact with the work is required. Toward this end, optical electronics provide a new solution.

Economic marginal conditions force industry in increasing measure to introduce automated fabrication processes and quality controls. Production structured along these lines requires the use of computer-controlled measuring, control, and regulating systems. The availability of affordable, reliable microelectronic devices rapidly promoted the necessary adaptation of measuring control and regulating technology within the area of measuring quite rapidly and compelled the subsequent development of appropriate sensors.

In view of the fact that fabrication is predominantly characterized by mechanical processes, sensors for geometry-based magnitudes as well as for production (for example, sensors to sense gaps, position workpieces, form, and force) and product-oriented sensors (for example, surface roughness and freedom from defects) are being developed on a priority basis. Recently, however, an increased demand for sensors to control processes must be taken into account, for example, those sensors performing functions in heating, ventilation, and air-conditioning equipment (temperature, humidity), in chemical analysis, or in emission control (gas concentrations).

With respect to both of these key points, interesting concepts for sensors are presented by optical electronics which are part of microelectronics with respect to technology and signal configuration.

"Classic" components of optical electronics in the sense of sensors are radiation detectors as photoconduits or photoiodes. In silicon technology these are today essentially standard sensors which virtually all significant semiconductor fabricators offer in great specificity with regard to sensitivity, modulation band width, etc., for spectral areas below 1 micron.

With respect to geometric measuring equipment, integrated photosensors as linear or area arrays are of particular interest in charge-coupled devices. Such arrays are available with more than 3,000 sensor elements with magnitudes starting at 7×7 microns² and down (offered by, for example, Fairchild, Texas Instruments, and Toshiba).

The user profits even here from competing offers: In 1985, for example, the price of the frequently used linear Model 2048 element array dropped from around \$1,000 to about \$300. For purposes of comparison, the planar sensor arrays are expensive and technologically still capable of being improved. Nevertheless, a 3.5-micron technology, encompassing 350,000 sensor elements, is already being placed on 40-mm² chips (for example, Thomson-CSF or Valvo).

The spectral area of around 1.3 microns and 1.5 microns, which is suitable for fiber optic communications equipment, has also undergone similar development in other technologies, primarily with respect to InGaAs and InGaAsP. For the spectral area above 1.5 microns there are photosensors based on the PbS-PbSe or the CdHgTe system, particularly in combination with integrated optical filters.

In addition to these sensors based on semiconductor optical electronics, recently fiber optic sensors with light wave conductors made of quartz or plastics have found great interest. With respect to appropriate multimode sensor, the parameter to be measured (for example, temperature or pressure) modulates the intensity: With respect to monomode sensors, the phase or the polarization of the light acts as modulator.

The advantages of this new type of sensor are in its small size (typically 100-micron diameter), in its invulnerability with respect to electromagnetic disruptions, and in the combination possibilities of sensors and signal transmission in appropriate (fiber optics) technology.

The market already offers multimode sensors for temperature (Luxtron and ASEA), acceleration (ASEA), charge status (Fafnir, Hella), refractive index (Schmidt and Hensch), and gap (Thomatronic). An accuracy of $\pm 1^\circ$ C is characteristic of fiber optic temperature sensors in the area between 0° C through 200° C; fiber optic charge status sensors are accurate to within 0.1 mm in measuring fluid levels.

Monomode fiber sensors are currently not yet introduced into production. Of special interest are rotation sensors for fiber optic gyroscopes. There are prototypes (for example, by SEL and Thompson-CSF) with rotation sensitivities of up to 3° and--provided integrated optical phase modulators are used--drift ratios of less than $0.1^\circ/\text{hr}^2$.

According to J. Zilber of Kessler Marketing Intelligence, Newport, United States, the market for such fiber optic sensors in 1983 worldwide (not counting the CEMA area) was only \$20 million, but by 1993 it is expected to rise to \$300 million. Obstacles in achieving this goal with respect to monomode sensors include the still too expensive technology; with respect to multimode sensors, they include disruptive intensity variations involving the input and output fibers.

In the FRG a widely based BMFT-promoted research and development association involving the Fraunhofer Institute for Physical Measuring Technology, the Philips Research Laboratories, as well as Daimler-Benz, Degussa, Draegerwerke, HDW-Elektronik, Messerschmidt-Boelkow-Blom, and Siemens, is conducting an experiment, since the beginning of 1986, aimed at solving this problem of line neutrality within the next 3 years on a systems basis, that is to say, for bus-compatible fiber optic sensor systems, for example, for automobiles or for chemical process control.

The systems-technical marginal conditions for this as well as most other measuring, control, and regulation tasks are appropriate for the selection and use of sensors. Frequently, these marginal conditions are similar so that development of standardized modules and subsystems becomes a technical and economically meaningful goal.

The combination of optical electronic sensors with optical electronic transmission elements (LED's, diode laser) in hybrid or integrated form could occur, for example, in such a subsystem which might be still further expanded through the use of fiber optic signal transmission.

One finds such subsystems already in existence with respect to laser scanners for robot-controlled workpiece recognition on production lines (Siemens), in systems used to measure workpieces in metal-turning machines (Samson), or used for surface quality control with respect to freedom from defects (Volpi). In processing measurement equipment, optical electronic charge status measuring instruments (BASF) are being built, as are gas and liquid analyzers (Maihak, Sick).

These and other developments which intelligently combine the latest electronics and sensor technology are important for flexible measuring, control, and regulation equipment. Elsewhere also (for example, in Great Britain, the United States, and Japan) this path is being followed consistently.

5911

CSO: 3698/508

WEST EUROPE/MICROELECTRONICS

PHILIPS SAYS SUBMICRON CHIP PLANTS POSSIBLE FOR FRG, U.S.

Rotterdam NRC HANDELSBLAD in Dutch 24 Apr 86 p 18

[Report on interview with Philips Division Manager C. Krijgsman by editor Dick Wittenberg: "Megabit Knowledge to U.S. and Hamburg"--"Philips Opens Megachip Plant in Nijmegen end 1986, 1/2 Year Late"]

[Text] Eindhoven, 24 apr--After the construction of a new chip factory in Nijmegen, Philips will also establish production facilities in Hamburg and in the United States in order to apply submicron technology. That appears from a discussion with engineer C. Krijgsman, IC Manager of the Elcoma Division of Philips. He does not desire to give many further details.

Engineer Krijgsman is a cautious man, perhaps even a suspicious man. He weighs every word. Most of all he prefers to get lost in generalizations which don't benefit anyone but which in any event don't harm Philips.

On Monday the highest point of Fab'87--as the new building in Nijmegen is fondly called--will be reached. On that occasion further announcements will be made which Krijgsman does not want to anticipate. Hence he answers only in general terms when asked about the cost of the project. He says that the construction of an IC plant costs between 350 and 500 million guilders these days.

It is in any event certain that the factory will be put into operation at the end of this year, half a year later than was originally planned. As to the cause of that delay, the Philips manager is not very communicative. Krijgsman mentions a "cautious adjustment." He says that "no exaggerated significance should be attached" to this change in the time schedule. Possibly the delay is connected to the malaise in the chip industry which caused the board to decide to spread the investment over a longer period. Krijgsman prefers not to go into that aspect either.

In the initial phase, only the known types of integrated circuits will be made with the aid of proven technologies. That learning period will serve to obtain a maximum degree of control over the production process. The intention is also to utilize the invested capital from the very beginning.

Only at the end of 1988 or the beginning of 1989 will the process be started for which the new building is actually equipped: the mass production of megabit chips on the basis of submicron technology.

Toward that time it will become evident whether the megaproject of Philips and Siemens has become a success. The goal of that concentration of manpower is to develop the submicron technology necessary for the production of megachips in a timely manner. That involves integrated circuits of 1 square centimeter on which over 4 million components are aggregated. The smallest details have a measurement of 0.7 micron; 0.00007 millimeter. [as published]

In the framework of the megaproject, Philips has already had a pilot plant built near the physics laboratory in Eindhoven. It will be fully equipped in July of this year. Fab'87 will be largely identical. In the new Nijmegen building also, the actual production space will occupy less than 10 percent of the area. The largest part of the building, which looks like an old-fashioned chip with legs, will be used in the battle against dust. Dust particles, namely, are the greatest enemies of unblemished chip production. Therefore, a maximum of only one dust particle of over 0.5 micron will be allowed per cubic foot in the chip lab of Fab'87. In comparison: it is estimated that a cubic foot of outside air contains 10 million such particles.

Krijgsman says that a similar factory will also be built in Hamburg in due time. He prefers not to mention the actual date, however. "Probably in the short term, but the phasing is flexible," he says. "If we have another bad chip year like 1985, we might delay the construction for half a year."

As to the establishment of a plant in the United States where the submicron technology could be applied, the Philips manager doesn't want to talk at all. At first he calls that speculation "not yet the opportune moment," and later he explains that announcements about such types of investments in the United States could only lead to unnecessary commotion. He reminds us of the uproar in the FRG when Siemens decided to purchase production knowledge from Toshiba. It was assumed, completely erroneously, that through this cooperation results of the megaproject might leak away to Japan--even while the megaproject is in fact being generously supported financially by the German and Dutch governments in order to defend the European industry against the Japanese. How would the outside world react if now it became known that the results do, however, end up in the United States? Krijgsman calls it "a particularly sensitive matter."

Ultimately the Philips manager confirms that it would be unthinkable that Signetics, the 100 percent daughter enterprise of Philips in the United States, would remain deprived of the submicron technology. "Your perception is 100 percent correct," Krijgsman admits. "The initiative for the development of the submicron technology is here in Europe, but we will also have to use that knowledge elsewhere in the world."

According to Krijgsman it is not necessary in the coming 5 years to build more factories appropriate for the submicron technology. He points out that the number of applications for the megabit chip will still be limited at the end of the eighties and beginning of the nineties. The greatest demand for such

integrated circuits will only come later. Simultaneously the need for the less complex types of chips will continue to exist. By that time Philips will be fully involved in the developments of yet another new generation of chips. Investments in that respect will once again increase dramatically. According to Krijgsman those costs will only be feasible for enterprises which have adequate support: sufficient sales, a good relation with the market and support of the environment. Only those companies will be able to survive the cycles which happen to be characteristic of the chip industry: the periods of undercapacity and overcapacity, the periods of gains and losses. Krijgsman therefore expects the number of chip companies to thin out during the coming years. "Perhaps 10 companies will remain, perhaps 15, but certainly not 50."

The Philips manager expects that 1986 will still carry traces of the worst malaise the chip industry has known so far. It won't be as bad as last year, when the world market for chips decreased by almost 20 percent, but recovery is very slow in starting. Krijgsman says that worldwide sales will increase by at most 10 percent in 1986. In the United States sales have cautiously pulled ahead since the end of last year. The Philips manager expects that also the European market, which still hasn't reached its lowest point, will start growing again by this summer. He is convinced that the troubles will be over in 1987. Then the world market will grow by at least 20 percent. Then Philips will also earn money again from the manufacturing of chips. "As it should be," says Krijgsman. "For the time being it can only go uphill."

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CSO: 3698/548

WEST EUROPE/MICROELECTRONICS

FRG RESEARCH ON NEW PROCESS ON SUBMICRON CHIP

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 2 Jun 86 p 7

[Text] Frankfurt--The endowment recently began supporting a project at the Ruhr University in Bochum which may take on great significance for future application in information and computer technology. Prof Dr Berthold G. Bosch and his colleague Dr Hans-Ulrich Schreiber intend to attempt to make inroads into the submicron structure range, i.e., less than a millionth of a meter, using a new type of technology in the construction of microtransistors.

Efficient integrated circuits with constantly increasing switching speeds are needed in information and computer technology. The silicon bipolar transistor is increasingly gaining in significance here because with it it is possible to penetrate ranges which were still considered unattainable a few years ago. Until now, in transistor technology the most hope has been placed on other, not unproblematic semiconductor materials such as gallium arsenide.

A reduction of the dimensions of transistors can not only significantly raise the upper limits of the operational frequency of the silicon bipolar transistor, but also can make possible the achievement of the higher switching speeds necessary as a result of today's increasingly greater data rates. The objective of the work at Bochum is, among other things, to determine the characteristics of transistors with the new minimal structures, what upper frequencies may be anticipated for the silicon bipolar technologies, and what smallest dimensions of specific transistor ranges are actually reasonable and economic for the fastest transistors. The results will be of great importance for the manufacture of integrated digital circuits with extremely high switching speeds. The Bochum scientists are basing their work on the known microtransistor technology, the so-called "emitter-to-base self adjusting transistor." This process provides for merely one adjustment and structuring step both for the emitter and for the base section of the transistor. A prerequisite is the very short linkage of the connections between the emitter and the base in order to eliminate unwanted parasitic capacitances and resistances and thus to increase the switching speed of the transistor. The currently known processes are very expensive in their technological production and not very flexible. Therefore, problems arise in their manufacture and reliability.

Within the Bochum project, the attempt is to be made, based on patents which have already been applied for, to produce self-adjusting bipolar transistors, for which the designation "flexible emitter-to-base self adjusting transistors" (FEBS) has been chosen, by a new process without expensive technological means. This process is impressive particularly for the possibilities for variations and for the high level of reliability of essential transistor characteristics. Furthermore, according to the Bochum researchers, the new process will permit the production of emitter widths of only a micron and less. This is, in fact, possible by means of various overlaying processes, although the available structuring tools are only suited for the application of line widths between 1 and 2 microns. The necessary engineering processes, for example, "reactive ionic etching," are currently being investigated in Bochum. In this way, Bosch and Schreiber hope not only to break the 1-micron barrier, but also to be able to introduce an incomparably more economic and reliable production solution opposed to previous processes. It is precisely these last factors which offer the opportunity for some success in the face of the pressing competition of the Japanese.

12666

CSO: 3698/511

WEST EUROPE/MICROELECTRONICS

EUROPEAN SILICON STRUCTURES UP, RUNNING

Paris ZERO UN INFORMATIQUE in French 28 Apr p 4

[Article by Dieter Murawsky: "ES2 in Search of a German Partner"; first paragraph is ZERO UN INFORMATIQUE introduction]

[Text] Now supported in France by Bull--and not Thomson, which has just set up its own ASIC [Application-Specific Integrated Circuit] division--the European facility for integrated circuit design and small-scale manufacture is preparing, to balance its budget. Two uncertainties remain: the participation of a large German electronics company and EUREKA financing.

The standardized data processing system producers are as greedy for mass-produced integrated circuits as the designers of specific systems are in need of small quantities of custom chips in the shortest possible time. In general, those series intended for industrial, space, or military applications, not to mention any others are limited to some thousands, indeed, even some hundreds of pieces.

Faced with the difficulties, especially in Europe, of obtaining such components using high-tech design, last September several semiconductor industry managers took the initiative to create a European facility for design and manufacture which will provide prototypes and low volume production series in a very short processing time. These custom-built circuits have become known by their Anglo-Saxon acronym of ASIC.

Seven month after launching the European Silicon Structures (ES2) project, the concept of Jean-Luc Grand-Clement, former vice-president of Motorola Europe, is becoming reality: financial arrangements completed; three regional centers (Munich, Paris, London) now operational; and the start of construction of a factory at Rousset, near Aix-en-Provence, planned for next June (to be in service in early 1987). More than \$35 million in equity capital is involved consisting of venture capital (\$4 million) and of capital contributions by the current partner companies, Olivetti, Philips, Brown Boveri, Saab Scania, British Aerospace, Bull, and Telefonica. Negotiations with two large German companies are still in progress and should be terminated within approximately 6 weeks. French authorities have announced their intention to support the ES2 proposals submitted to EUREKA.

Belgium, the UK, and Finland are also reported to support these proposals.

A 2-week Processing Time

Production speed should be reached by 1987-1988. From 1991 on, sales could exceed \$100 million representing 20 percent of the market. Total sales today are estimated at \$60 million.

Personnel will increase from 70 at present to 200 by the end of the year, and should reach 1,000 in 1991. Rousset alone will create employment for 600 people. When the new factory becomes operational, ES2 will be 100 percent European; until then ES2 is supplied by Exel in California. This company supplies a range of tools and services for the design of full-custom circuits, and the manufacture of prototypes and series which never exceed a maximum of 10,000 circuits per year. The use of 2-micron bimetal CMOS technology--which can go down to 1.2 micron--and the technique of direct engraving by electron beam (E-beam) permit processing times of 2 weeks instead of the usual period of more than 6 weeks.

The proposed design tools operate under UNIX. It involves "Solo," a virtual silicon compiler with a base price of some Fr 250,000; and "Echo," costing around Fr 1.5 million which permits the creation of its own CAD system. They are targeted for system designers who thus become integrated circuit designers.

It should be noted that the number of specialists in these two categories in Europe is estimated to be 130,000 and 8,000 people respectively. To indicate the importance he attributes to this transfer of know-how, Bernard Delapierre, marketing director for Southern Europe (France, Belgium, Spain, Italy, Greece, and Israel), does not hesitate to claim that "the technological revolution introduced by ES2 is comparable to the one which marked the arrival of the microprocessor."

25026/12951
CSO: 3698/A141

1 August 1986

WEST EUROPE/MICROELECTRONICS

BRIEFS

SYCOMORE VLSI PROGRAM--In the field of VLSI [very large-scale integration] circuits, the national SYCOMORE project brings together two industrial groups, Thomson and Bull, and two public laboratories, INRIA [National Institute for Research on Data Processing and Automation] and INPG [National Polytechnic Institute of Grenoble]. The project's objective is to develop an auxiliary system for the design of third-generation VLSI circuits, i.e., drawing heavily upon artificial intelligence techniques. Research began in October 1983 and should last 5 years, with 40 percent support from the MRT [Ministry of Research and Technology]. Since 1983 financing by the MRT has developed as follows: 1983, Fr 14 million; 1984, Fr 17 million; 1985, Fr 23 million; estimates for 1986 and 1987, Fr 26 million. The rest of the project's financing is provided by the four associates: Bull, INPG, INRIA, and Thomson. In total, the SYCOMORE project brings together approximately 75 researchers and technicians: 30 at Thomson, 20 at Bull, 15 at INRIA, and 10 at INPG. [Text] [Paris ZERO UN INFORMATIQUE in French 24 Mar 86 p 58] 25026/9435

FRENCH CNET'S MICRON CMOS--Established at Meylan in the suburbs near Grenoble, the Norbert Segard Center (CNS) of CNET [National Center for Telecommunications Studies] today appears to be the largest French public research center completely devoted to silicon microelectronics. Its research programs deal with all subjects pertaining to techniques for designing and developing very large-scale integrated circuits of the MOS [Metal Oxide Semiconductor] type. The ultimate goal is the development of complete technological product lines which can be transferred to industry. In fact, the company's objective as established in its 1983 master plan is to develop a micron-scale CMOS designed specifically to meet telecommunication needs. This product line is to allow the production of specialized circuits including complex logical and analog functions. The validation circuit of this technology is a videocommunications decoder which will include three digital to analog 8-bit converters on the same chip. Moreover, in the framework of the European ESPRIT program, the CNS has undertaken development of a submicronic (0.7 micron) CMOS product. The CAD system for Cassiopee VLSI circuits developed by CNS itself forms the core of this EEC-financed program, as well as that of the CORALIE project. [Text] [Paris ZERO UN INFORMATIQUE in French 24 Mar 86 p 59] 25026/9435

CSO: 3698/A106

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

ELECTION NULLIFICATION PARALYZES SCIENTISTS AT FRANCE'S CNRS

Reasons For, Effects Of Action

Paris LE MONDE in French 21 Jun 86 pg 32

[Text] The Council of State has just nullified elections of the CNRS (National Scientific Research Center) national committee. This committee--two-thirds of its members are elected from a voting list, one-third of them are named-- evaluates laboratories and studies proposals for promotion and hiring of researchers. It plays a key role in the functioning of the largest French research organization.

To quote a communique circulated by the Ministry of Research and Higher Education, the effect of nullification of elections, which was announced by the Council of State Monday, June 16, will be that the committee "whether it is a question of sections, interdisciplinary commissions, program commissions or department committees, will no longer be able to validly sit. As a result, " the work of these different bodies is immediately and definitively suspended. The same is true for the researcher recruitment competition juries

This last point is the greatest inconvenience in the short run, and according to the communique, "does considerable harm to laboratories which could be deprived, in 1986, of the contribution of young graduates from universities and institutes of higher education. The ministry has therefore assigned the general director of the CNRS--Mr Serge Feneuille, who replaced Mr Pierre Papon 15 days ago--the task of assembling within the next few days commissions of experts who will propose a list of researchers whom they consider it indispensable to incorporate. The latter will be offered temporary contracts until a new committee can validly review their applications. The minister indicated that " the rules governing the make-up and functioning (of the new committee) will be reexamined

Heated Labor Union Reaction

The principle researcher unions, which are part of the FEN and CGT, reacted violently to the Council of State's decision and the ministry's communique. They are contesting "the legal interpretation of a Council of State decision" and denounce "an extremely serious measure which demonstrates that the government holds the French scientific community in utter contempt. In their view, suspension of the work of the national committee "is the first step in the dismembering of the CNRS and, on a broader level, the organizational structure of research in the country

1 August 1986

The national committee of the CNRS is composed of 45 sections, covering the various disciplines. The sections have 25 members, 16 of whom are elected and 9 of whom are named. Election procedures, laid down by a July 27, 1982 decree, stipulate that elections be carried out using a voting list, with possible splitting of votes. The electors are distributed among five colleges.

It is the decree article defining vote splitting and announcement of election results that was annulled (art. 6). It was the Council of State's opinion that application of this article would result in miscalling of election results, thus validating the latter. The ministry further states that a revision in the responsibilities and composition of the national committee is already under consideration. The decision of the Council of State makes it essential to rapidly draw up a new text and then organize new elections. All this will take several months, which is why the announced temporary measures are necessary.

CNRS Scientists Comment

Paris LE MONDE In French 26 Jun 86 p 28

[Article: "Researchers Demonstrate for Employment and Against Budget Restrictions"]

[Text] "Funding for research." "We want funding for a scientific and technical research that will enrich the economic and social fabric of the country." For the first time in a long time, the scientific community demonstrated en masse. Tuesday, 24 June in the streets of Paris and in several provincial cities, particularly Strasbourg and Toulouse. According to labor organizations, 3,500 researchers marched through the streets of Paris to protest the Budget minister's decision in April to revoke funds and the consequences of a recent Council of State decision which threatens the recruitment and promotion of National Scientific Research Center (CNRS) personnel in 1986 (LE MONDE, June 21).

At the end of April, the assistant minister of research and higher education, Alain Devaquet, had partially reassured research personnel by stating that the CNRS and the National Health and Medical Research Institute (INSERM) "fundamentally sound organizations with a large number of very fine researchers and teams" would not be dismantled. Today, however, with 54 percent of state budget program authorization annulments in 1986 affecting research activities only, the scientific community is concerned about this policy of abrupt squeezes and is fearful of the future.

Budget ministry directives recommending savings and staff cuts (-1.5 percent) in 1987 could very well, if followed to the letter, deal a blow to "the effort of the last few years to get back on our feet" perceived by the majority of researchers. This is why, after demonstrating in front of the Sorbonne and the Ministry of Research and Higher Education, the scientists arrived at Matignon to submit a petition urging the government to maintain the minimum objective of creating 1,400 jobs in research projected in the three-year plan. (Certain unions, however, were quoting a figure during the demonstration of 900 possible position cutbacks next year.)

The Fear: "Dismemberment"

All this adds up to anxiety for CNRS personnel, who fear the "dismembering" of their organization and who have seen their participation in the evaluation of laboratories and recruitment of researchers slip through their fingers following the dissolution of the CNRS national committee and the questioning of its election procedures. True, temporary one-year contracts will be offered to certain applicants, but their number could be well below the number of vacant positions.

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CSO: 3698/544

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

SWISS PARTICIPATION IN EUREKA OUTLINED

Geneva JOURNAL DE GENEVE in French 28 Apr 86 p 3

[Article by Jean-Luc Lederrey: "Switzerland to Participate in One Out of Four Projects"]

[Text] Switzerland is currently involved to varying degrees or interested in participating in 18, or one out of four, Eureka program projects (72 projects have to date been officially submitted by different European countries). Fifteen companies, research institutes and universities in our country are already at work or have declared themselves ready to participate. They include in particular the following companies and institutions: the Zurich and Lausanne Federal Polytechnical Schools; the Neuchatel Swiss Electronics and Microtechnical Center; the Swiss Foundation for Microtechnical Research in Neuchatel; ASULAB (the SMH horological group research laboratory in Bienne); the University of Neuchatel; Brown Boveri; Valtronic SA; Mettler Instrument SA; Cerberus SA; Elektrowatt SA; Lasag SA.

Switzerland has taken the initiative of proposing several research projects and is also involved in a large number of projects initiated by other countries. The following are the principle programs in which Swiss companies or institutions will play an important role:

--Prolog: proposed by Switzerland, the aim of this data-processing project is to develop "expert systems" using the Prolog computer language. The Swiss participants are Brown Boveri in Baden, Mettler Instrument AG in Greifensee, and the Data-Processing Institute of the Zurich Polytechnical School.

--New techniques for coating materials with thin films. This project, suggested by Switzerland, brings together the Lausanne Federal Polytechnical School, the Swiss Foundation for Microtechnical Research, the Swiss Electronics and Microtechnical Center (SEMC), Cerberus SA and Asulab SA.

--Development of wide diffusion integrated sensors. The goal of this project is to establish a production line of mechanical-scale sensors, manufactured by micro-machining of silicon. The Swiss partners are the SEMC, Valtronic SA and Cerberus SA.

--A computerized engineering unit. The Swiss partner is Elektrowatt SA.

--"European Silicon Structure". This project's objective is to create new integrated circuits for special applications. Brown Boveri is the Swiss partner.

--Civilian defense mobile robot. Swiss partner: SEMC.

--Development of software manufacturing workshops. The goal: to create software engineering workshops capable of developing applications in the areas of systems, management and artificial intelligence data-processing. Swiss partner: Industrial Radioelectricity Co. (CIR).

--Automated production management using artificial intelligence. Swiss participant: Brown Boveri.

--European research network. The goal of this project is to link the principal university, public and private research centers in Europe through a computer communications network, allowing increased exchange of information.

--Flexible optoelectronics workshop. The goal of this project is to create an automated shop, utilizing the potential of the laser in cutting, surface treatments, etc. Swiss participant: SMH/Lasag.

Switzerland has also expressed an interest in participating in the following projects:

--Manufacture of amorphous silicon and the development of applications for this technology in conversion of light to electricity, flat screens, etc. The University of Neuchatel is particularly interested in this project.

--Design and manufacture of filtering membranes for water purification.

--Development of new, laser industrial applications.

--Development of gallium arsenide-based integrated circuits.

--Laser beam destruction of chemicals.

--Development of thyristors for electronic command of high levels of electric power (especially in the area of rail traction).

--Development of new, automated manufacturing procedures, in order to create the "automated factory" of tomorrow.

For more information, please write to the Federal Office of Education and Science, Wildhainweg 9. PO Box 2732, 3001 Berne.

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CSO: 3698/524

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

EEC DEVELOPING VENTURE CAPITAL ASSOCIATION

Amsterdam COMPUTERWORLD in Dutch 1 Apr 86 p 5

[Article signed J.S.: EVCA Wants Funds from EEC Budget"]

[Text] Brussels--The European Venture Capital Association (EVCA) wants greater European Community involvement in venture capital projects.

The until now experimental aid should be institutionalized and included in the annual European budget. The EVCA feels that this could provide new and innovative companies with start-up funds more quickly, which could also stimulate internal cooperation in European industry.

Extending the System

So far the European Commission (the administrating body of the European Community in Brussels) has invested 3.3 million ECU (8.25 million guilders) in a fund set up by a group of leading European venture capital investors.

The EVCA wants the European Commission to suggest to the 12 EEC countries that the "Venture Consort" system be continued, while the amount provided by the EEC should also be increased.

The EVCA recently received the backing of H. Burgard director general of the EEC department for intercommunity innovation and technology transfer. This occurred in Brussels after Vice President Neil Cross had pleaded in favor of the system's continuation.

Burgard said that he will put a proposal to the EEC to call upon its member states to earmark 10 million ECU (25 million guilders) from the 1986 budget for Venture Consort.

Waiting List

Venture Consort has so far financed some 13 projects, but another 100 or more projects are still on a waiting list. The European Commission financed 10 percent of each of the 13 projects. In all a total of 6.25 million guilders has been invested in these projects.

The investment projects are subject to speedy approval. When the EVCA agrees to a certain project, it is referred to the European Commission, which has to say yes or no within 10 days. Failing this, the project is automatically approved at the end of this period.

Given the habitually slow operation of the Brussels bureaucratic machine, this is of course extremely fast and possible unprecedented in the European Commission's proceedings.

The EVCA, however, also criticizes the Commission, because, in addition to Venture Consort, it wants to set up a second, similar initiative under the name of Eurotech Capital.

25033/12948
CSO: 3698/A115

WEST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

BRIEFS

FRENCH VENTURE CAPITAL ACTIVITY--Innovacom, a department of Sofinnova created in association with the DGT [General Directorate of Telecommunications], announces that it has invested a bit more than Fr 14 million in 12 enterprises during its first year of activity. It has intervened in particular to reinforce the equity of SOFREL (data communication products), PRA Informatique (videotex service, test systems, etc.), CIAC (complex systems engineering), and BERME (access control systems). Moreover, Innovacom has participated in the creation of two companies: Picogica (epitaxial processes in gallium arsenide) and Digipress (laser etchings of data on compact disks). [Text] [Paris ZERO UN INFORMATIQUE in French 21 Apr 86 p 4] 25031

/12951

CSO: 3698/A136

WEST EUROPE/TECHNOLOGY TRANSFER

MBB'S CONTRACT WITH CHINA, NEW PRODUCTS, COOPERATION PLANS

Duesseldorf HANDELSBLATT in German 9 Jun 86 p 18

[Article: "Cooperation With China Agreed"]

[Text] On the first day of the exposition at the ILA in Hanover, Messerschmidt-Boelkow-Blohm was able to come up with the signing of a long-anticipated cooperation agreement with CATIC (import and export company of the Air Ministry of the People's Republic of China) for the development and production of a medium-range transport aircraft with 70-85 seats and a range of 1,800-2,700 km.

The contract is the most important indicator of the fact that the "cooperative lassitude" which had been found to exist at the last ILA exposition 2 years ago by Messerschmidt-Boelkow-Blohm chief, Dr Hanns Arnt Vogel, had turned into the opposite phenomenon.

The so-called commuter aircraft, designated MPC-75, will be equipped with two power plants of the most modern technology (Propfan) which will give the newly developed aircraft a speed of 0.75 to 0.78 Mach with 10 tons of thrust. Because this is breaking new technical ground, the MPC-75 will not be flying before 1994. According to Vogel, a division of responsibilities has not yet been struck between MBB and the Chinese, although MBB will manage the program.

The cooperation between MBB and the People's Republic of China is intended not only to initiate a new product within the Airbus family but is also intended to contribute toward maintaining the capability to lay out total systems in the aircraft industry.

At the ILA booth, the men from Munich present themselves as "MBB--the leading firm of the German aircraft and space industry." The high-tech concern thus wishes to represent, among others, that it is an adequate partner for even large foreign enterprises. This was also reflected in the speech to the press given by MBB director Vogel. In the last 2 years since the previous ILA exposition, prognosticated results had been achieved.

Many Successes Through New Structures

These successes were attributed to the introduction, at one time, of a new enterprise and management structure, through the continuation of acquisition or development and production with respect to the aimed-for large-scale programs through diversification in the form of new products for new markets--including in the area of "industrial products" and "energy and processing technology" and, finally, through the creation of new cooperation agreements and the establishment of MBB bureaus in relevant countries.

With respect to the individual program areas, Vogel stated that despite 4 failures in 18 launches, the European carrier rocket Ariane can be designated as much of a success as the launch of European satellites and the utilization of Spacelab during the course of the indicated D-1 mission. Furthermore, the path is being indicated in Europe for the autonomous use of space by the Ariane 5 program, the Columbus space station, and the Hermes space transporter. He said that MBB was sure of playing an essential management role in this European spaceflight scenario. There is also confidence that the participating European governments will approve the program starts for both new Airbus types--the Model A-330 and the Model A-340 to round out the Airbus family.

Eurofighter GmbH Established in Munich

An order for 80 Tornados by the Saudi Arabians and Oman is said to have contributed to plugging the gap between the Tornado and the "Fighter 90" program by a "stretched production," particularly since the continuation of the "Eurofighter" large-scale program in the last 2 years has caused considerable problems. In the meantime, however, it is reported that the Eurofighter GmbH Co. had been established in Munich. MBB and British Aerospace each participate with 33 percent, Aeritalia with 21 percent, and Spanish Casa with 13 percent. As in the case of the Tornado, the components for the total program of around 800 units are to be manufactured in one or another country. Final assembly, however, is to be accomplished in each of the four partner countries.

Also, the antitank helicopter Model PAH-2 is to be built under cooperative conditions and, for this purpose, MBB and the French Aerospatiale are said to have established Eurocopter GmbH with its headquarters in Munich.

It was said that it is precisely the helicopter area that is a problem area characterized in all Europe by excess capacities and that a way out must be sought. Despite the granting of a license by Sikowsky to Westland for production of Seahawk and Blackhawk helicopters, it is believed that the "train has not yet departed for a European cooperative project." MBB is said to be "internationalizing" its activities in the helicopter area. Thus, MBB is producing the Model BO-105-LS helicopter in a specially established company in Canada. For India, MBB is cooperating in developing an advanced light helicopter (ALH). Together with the Indonesian partner IPTN, MBB is examining development of a small helicopter--Model BN-109. The greatest attention is being devoted to the plans for the NATO NH-90 helicopter which is planned for the middle 1990's.

After Chernobyl, a new topicality--a new cooperation is said to have begun for MBB involving the Nukem Co. in Hanau and the wholly owned French subsidiary Solems in the area of amorphous silicon technology. The task here is: direct conversion of sunlight to electricity.

In the final analysis, MBB is trying consistently to obtain orders within the framework of the SDI program of President Reagan. It is hoped that, in the foreseeable future, a first order will be received from the SDI Bureau. As first order supplier, MBB would like to do an "architectural study" of the European threat scenario, together with the elite of Europe's and America's technology enterprises so as to be able to render convincing contributions to this activity which is essentially oriented toward the defense against aircraft and missiles.

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CSO: 3698/508

WEST EUROPE/TECHNOLOGY TRANSFER

DISCUSSION OF NEW COCOM LISTS, FRENCH ENFORCEMENT POLICY

Paris LE FIGARO in French 5 May 86 p 64

[Article by Christian Lamoureux]

[Text] The new lists of restrictions on "vulnerable" exports drawn up by France reflect technical developments in the Eastern-block and in the West rather than any change in policy.

The tightening of restrictions on sales of Western technologies to Eastern-block countries starting in 1980 was perceived by many as a punishment, a sanction imposed on the USSR for its role in Afghanistan and Poland. And it was in fact these two affairs, together with American pressures, which convinced many European countries to accept the reactivation of Cocom (or Coordinating Committee, a Western organization responsible for monitoring and coordinating the sale to Communist countries of products presenting a possible security risk). However, this step amounted to placing the technological embargo within a context of sanctions and threatened to transform the committee into an instrument of foreign policy, whose rigorousness would have been a function of apparent variations in Soviet behavior.

The rationale behind restrictions does not stem from a process of reasoning based on sanctions, but on security. The latter is expressed in a rather simple, on the whole modest, but nevertheless difficult goal: to attempt to maintain the technological lead of Western weapons systems and thus to allow a lapse of time before certain critical technologies--and the costly research they entail--are too cheaply and too quickly surrendered to the USSR and its allies. There is no standard for measuring "lead-time", for the goal sought is the preservation of a technology which enjoys a lead over others.

To maintain a lead and to allow a time lag: this is an objective which must be constant and which should not, in principle, be affected by any particular exaction made by the USSR outside its borders or, on the contrary, by an individual gesture made by Moscow. However, there was real confusion in Western policies, especially in the United States, during the period from 1980-1983.

This confusion, which was at the root of quarrels between allies, was able to be partially overcome with the accord on new embargo lists agreed on at Cocom in July, 1984 after two years of negotiations. Cocom has no international statute; it was created in 1950 by simple intergovernmental accord and the decisions, always unanimous, made within it can only be implemented by national legislation in participating countries. (Footnote 1) (These include NATO members, (except Iceland), plus Japan; the targeted countries include those of the Warsaw Pact, plus Albania, China, North Korea, Outer Mongolia and Vietnam.) Thus, it is up to the latter to inform their exporters of the nature and specific details of the materials and technologies subject to control.

This is what the French government did several months ago when it published the new lists in the "Official Journal" of last December 5, in the form of a "Notice to Importers and Exporters".

In France, the legal basis for restrictions remains the "control of ultimate destination" regulations, which have already been in existence for a long time now. Their goal is to verify the real identity of the ultimate user and the actual use he will make of the exported product. These regulations, which make exportation subject to procural of a license from the administration, apply equally to nuclear materials and installations (articles A.1 to C.6 of the lists), war materials (articles 101 to 124) and "dual use" products and technologies (civilian and military, articles 1,001 to 1,801). Moreover, for this last type of export, the French government has set up a specific procedure, effective since October of 1981, intended to more closely monitor critical technology transfers to a certain number of countries, essentially those targeted by Cocom. This is carried out under the auspices of an interministerial surveillance committee, presided over by the secretary general of the government.

Do the new lists of limitations reflect a more restrictive policy vis-a-vis the Eastern-block countries? Stated in this way, the question is not altogether pertinent. Nearly all of the articles were revised. A large number of technologies, which had become obsolete or widely diffused, were eliminated. Others, more recent, were added. After all, the severity of restrictions depends as much on the strictness with which these lists are enforced as it does on the number and scope of the articles which make them up.

In principle, the lists themselves only mirror the comparative technical developments in the Eastern-block and the West. For this reason, the majority of the technologies added naturally belong to the sectors considered to be the most critical, that is, those apt to lend themselves to direct and important military applications: microelectronics, data-processing, fiber optics, robotics, space, etc. The chief modifications concern data processing: microcomputers are no longer subject to embargo, but restrictions on certain powerful minicomputers and large calculators have become tighter; moreover software programs are subject to control for the first time. The other additions deal primarily with time commutation, digital-command machine tools, semi-conductor manufacturing equipment, electronic quality silicon, superalloys and certain composite materials.

For all targeted materials and technologies, the lists provide extraordinarily detailed and technical specifications on the characteristics and performance limits defining restriction thresholds. Thus, the two articles devoted to computers and software programs (articles 1,565 and 1,566) fill 12 pages of the O.J., printed in small characters. Therefore, judgement of a product's position with respect to the embargo can only be made on a case-by-case basis. However, it is perfectly clear that the new lists in no way strengthen Moscow's thesis that Cocom constitutes an obstacle to East-West exchanges or that it aims to slow the growth of the Soviet economy. The technological embargo affects a tiny fraction of Western sales and leaves open tremendous possibilities for trade, including trade in the area of advanced technologies. One can only conclude that, for the last few years, it is the USSR that has not considered it worthwhile to take advantage of them.

This being the case, the evolution of Western policy is indicated as much by the fate reserved to requests for derogation of the embargo and, above all, by the determination and resources marshalled by Cocom members in the enforcement of restrictions. Cocom does not in fact confine itself to drawing up embargo lists; it also grants derogations, "exceptions" to this embargo. There are two categories of exceptions: "administrative" (derogation can be obtained by the exporter directly from his government, without prior agreement of the committee) or "general" (a formal request for derogation must be submitted to the committee by the member country concerned and can only be granted by unanimous decision of the delegations). The first procedure applies only to the "bottom-of-the-line" of the embargo. In the French lists, this "bottom-of-the-line" is defined by notations added to the end of each article and dubbed "administrative option notations". It is apparently the policy of the government to conduct rather favorable investigations of cases involving these technologies. On the other hand, for "general exceptions", the rule of unanimous decision tends to impose the position of the most restrictive member country on all participants, in this case, the United States. It is the US, however, which took the initiative of pursuing a policy of prudence with respect to China: last year, the latter was the beneficiary of almost all derogations. The trickiest problems today, however, are raised by the need to harmonize national procedures for control. In order for control to be effective, all Cocom member countries must have more or less the same policy. Certain countries are notorious for dragging their feet. It is easy to understand that this alarms the United States, especially given the possibility of significant participation by European countries in the SDI. But the United States is not alone in its concern. France is also concerned: as much as it desires to respect the rules of the game, it does not intend to impose on its own exporters restrictions from which their main competitors are exempt.

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CSO: 3698/523

WEST EUROPE/TECHNOLOGY TRANSFER

FRENCH TECHNOLOGY PARKS SUCCEED IN ALPS, RIVIERA REGIONS

Grenoble: Center for S&T

Duesseldorf VDI NACHRICHTEN in German 9 May 86 p 32

[Article by Pascal Boulier: "Grenoble--An Advance Rider of the Transfer Idea: Cooperation Between Advanced School and Industry Based on Long Traditions"; first paragraph is VDI NACHRICHTEN introduction]

[Text] The economic-industrial upswing of the Grenoble region was connected with a few pioneers in the past who used their personalities to persuade the local authorities and who contributed to changing the economic face of the region. The author is an industrial adviser to the Chamber of Commerce and Industry in Grenoble.

In the first place, one must mention Eng Aristide Berges, who settled in Grenoble in 1867 in order to test his invention--the use of water force in pressure conduits for the production of electricity in the Alps. The inventor Zenobe Gramme made an important contribution in this area with the first industrially usable generator. This made hydroelectric power plants, producing electricity for the processing industry, equal with coal-burning power plants and Grenoble became the center of waterpower use. The enterprise of Aristide Berges was successful.

The mastery of electric energy assumes technical knowledge. For this reason, in 1901 the first specialized school for electrotechnology was established. With such a productive energy source in the immediate vicinity, the industrialization of Grenoble could no longer be halted. In 1920 Merlin Gerin transferred his enterprise from Lyon to Grenoble. Following development of electric machinery construction, radio technology had its turn: in 1955, just outside Grenoble at Saint-Egreve, the first facility for the fabrication of diodes and transistors was established. In 1960 scientists in Grenoble developed the first process calculator in France. This marked the beginning of a new era in the history of technology--electronics.

In 1965 future Nobel Prize winner Louis Neel, chief of the Nuclear Research Center in Grenoble (CENG), made his contribution in the innovation sector: he persuaded the Atomic Energy Commission (CEA) and the state Center for Scientific Research (CNRS) that they should combine their research activities.

This collaboration culminated in a program for the development of integrated circuits at MOS-Technik (Metal Oxide Semiconductor). In order to break the quasi-monopoly the United States held in the area of electronics, Grenoble scientists established a firm for the economic evaluation of scientific research results. The firm received the name Laboratoire d'Electronique et de Technologie de l'Informatique (LETI) and produces measuring instruments, magnetometers, tomographs, and other instruments pertinent to modern electronics.

At the same time, Hewlett-Packard, one of the largest electronics companies in the world, decided on Grenoble as the location for its French subsidiary.

It was 1968: The Olympic Winter Games see to it that there is worldwide publicity and draw the picture of a dynamic city in an impressive environment. Grenoble established two organizations--the BIEN [Bureau d'implantation d'entreprises nouvelles] and the SADI [Societe d'amenagement du departement de l'isere] to promote the influx of industry. The growing preference for the City of the Dauphine is also reflected in the growing number of students. Moreover, Grenoble became the first city in France to make continuing and postgraduate education the nucleus and focal point of its economic development. Men such as Paul Louis Merlin, Felix Esclangon, or Louis Weil share decisive responsibility for the fact that their city can cover the demand of industry for qualified specialists by establishing professional and specialized engineering schools.

The involvement of science in industry continued in 1972 with the establishment of a new firm for the development and fabrication of special integrated circuits by the CENG: This was the EFCIS [Societe pour l'etude et la fabrication de circuits integres speciaux] and it became the new star among the electronics firms of Grenoble.

In this favorable environment, the plan for the creation of a technology park to accommodate establishments active in the sector of high technology gradually germinates. With the influx of several daring entrepreneurs, the plan begins to take shape in 1974; the Zone d'Innovation et de Realisations Scientifiques et Techniques (ZIRST) developed into a spiritual center of key technology. In order to be able to meet these high requirements in the future as well, an admissions committee was created whose mission is to test future candidates for relocation.

By 1982 the ZIRST already had 60 enterprises employing approximately 2,500 persons. The attractiveness of this technology park continued to grow: In the following year alone, another 30 firms joined the facility. The concept of a "French Silicon Valley" is heard.

The Chamber of Commerce and Industry of Grenoble plays an active role in the framework of economic development. By the end of 1983 the Innovation Promotion Program--PVI (Promotion et Valorisation de l'Innovation), is addressed and is supposed to differentiate between existing enterprises or promote the establishment of new enterprises capable of providing innovation. During its first working session some 20 projects out of 200 proposals were selected and 15 were finally realized.

The Chamber of Commerce and Industry also took up the idea of unifying younger establishments and established a market where people, capital, and enterprises could meet--the Marche Alpin--which takes place every 2 months and at which inventors, enterprise founders, and entrepreneurs can find the providers of capital to finance their ideas or their planned diversification and where they can find technical partners for their projects. Operating office space or subcontractors are also brokered here.

Two years later the PVI had created 200 new jobs in 40 new firms. The following year the state Polytechnic Institute of Grenoble (INPG) arranged for the combination of six engineering specialized schools under the influence of its president, Daniel Bloch, into a Center for Technology Transfer in order to be able to offer enterprises a technological and scientific infrastructure (instruments and materials, measuring instruments and computers) at a high level, as well as to be able to make available the potential of its 700 teaching and research personnel.

To round out the picture, the CENG, which has been participating in economic development in the region for the past 3 decades, established a new Center for Promoting the Influx of Industry and of Technology Transfer: the Aire de Service et des Transfert de Technologie (ASTECC). This new breeding site for progressive technologies is supposed to be activated this spring and to make possible the development of new types of products through the use of multidiscipline developmental teams from research and industry.

With its Chamber of Commerce and Industry, with its economic advanced school, with the INPG, with the universities, and with the CENG, Grenoble has an entire spectrum of organizations in order to promote the development and transfer of new technologies.

Meanwhile, Grenoble can look back upon numerous examples of successful enterprise establishment and dissemination of new technologies; a listing which would be only partially complete would far exceed the space available to the author.

Riviera Attracts Advanced Technologies

Duesseldorf VDI NACHRICHTEN in German 9 May 86 p 29

[Article by Pierre Lafitte: "The Silicon Valley of the French South"; first paragraph is VDI NACHRICHTEN introduction]

[Text] Regional authorities and national government have a natural interest in regional development. A modern economy must adapt more rapidly to new developments than was the case 20 years ago. Scientific results and technological innovations must be transformed into commercially usable products as rapidly as possible. Science and technology parks represent one of many possible ways.

One of the best-known [technology parks] is Sophia Antipolis on the French Mediterranean coast. Technology parks represent a relatively new concept:

The local concentration of men and women occupied with technical study and research at a high level or who are active in an industry marked with high technologies. At the beginning of the realization of Sophia Antipolis there was a group of friends and the French Mining Academy in Paris, as well as support by the General Council and by some leading innovative firms and personalities in the Maritime Alps Department.

Today (1986) the Sophia Antipolis Technology Park offers employment and income to 20,000 families, be it directly or indirectly through the service industry, housing construction, etc.

Its area encompasses 2,400 hectares of which one-half is reserved for a protective green strip. Some 650 hectares are set aside for scientific, education-oriented, and industrial activities, which will result in a total of 30,000 jobs once the various zones have reached full capacity. In 1987 it is planned to double the area so as to facilitate a future expansion of the potential.

In 1986 a total of 130 firms, establishments, associations, and other organizations began operating at the park. The following are examples:

- a. large multinational enterprises: Digital Equipment, Dow Chemical, Dow Corning, Searle, Rohr and Haas, L'Oreal, Nestle, Thomson-CSF, Telemecanique, Welcome, Cordis, Telsystemes, and--soon--Aisin-Seiki;
- b. national research organizations: Centre Nationale d'Etudes Spatiales (CNES), Institut National de la Recherche en Informatique et Automatique, Agence Francaise pour la Maitrise de l'Energie;
- c. advanced schools and specialized schools: Ecole des Mines (French Mining Academy), CERAN, University of Nice, CERISI.

Today, the Cote d'Azur can look confidently to the future, just as California or the so-called Sunbelt in the United States, in other areas also: It is a European region which, with its combination of modern technology and entrepreneurship, attracts investors of risk capital. The Cote d'Azur Developpement (CAD) (Footnote) (The CAD is a joint-use organization. Its president is the mayor of Nice, Jacques Medecin. Its manager is Thierry Martin. The author of this article is one of its vice presidents.), which is promoted by the regional authorities, is available to all companies with counsel and service--companies which are interested in a contact with this important technology market.

Sophia Antipolis developed in three phases:

- a. During the first phase we utilized representatives of research and education from the fields of technology and from industry in order to establish an industrial, technological, and scientific network without precedent in this area of the French Mediterranean coast. This initial phase lasted 15 years--from 1969 through 1984.

b. The second phase began in 1980. Its developments gained in tempo in 1984 and are expected to peak as of 1986-1987. It is characterized by a lively technology transfer and by various new establishments, training programs, specialized trade fairs, international contacts, etc.

c. The third phase has only just begun. Its goal is the strengthening of the influence the technological and cultural center exerts upon its extended environment. A basis for this effect will be created primarily by new computer-supported communications systems. This process could lead to a counterpart to the American Sunbelt around the year 2000 in conjunction with similar projects at Turin, Marseille, Montpellier, Toulouse, Bordeaux, and Barcelona.

In establishing Sophia Antipolis, it was decided to bet on the traditional image of the Cote de'Azur:

- a. the pleasant climate and the high standard of living;
- b. international transportation connections.

Selection of a location on a green meadow in a hitherto untouched hilly area naturally results in the need to build up an extensive infrastructure. Moreover, the possibility presented itself for a clean architectonic solution and for optimum protection of the environment. Thus, for example, the construction area (built-up area times the number of stories) may not exceed 30 percent of the construction site.

In 1986 it is possible to draw the first balance with respect to the means invested in the technology park. The initial costs (road construction, transformer stations, electric power lines, water treatment facility, water lines, and sewer lines) and the construction costs for public facilities (police, kindergarten, grade school, etc.) were around 800 million francs. Most of this cost was charged to the purchasers of the land. The state and the department (Maritime Alps) contributed less than 200 million francs. The annual tax revenue is considerably higher than the public funds made available....

The total sum of the investments made by enterprises runs to approximately 7 billion francs in 1985 values.

Furthermore, the usefulness of the facility to the region, with its traditionally high unemployment quota, which benefited from the 5,000 direct jobs and another 15,000 jobs in the supplier industry and in the service sector, should not remain unmentioned.

At the beginning of 1986, with the support of the Maritime Alps Department and the Sophia Antipolis Foundation, a bureau and promotion center for applicant entrepreneurs in the high-tech sector was established. In the first phase, this center occupies 600 m² but is scheduled for expansion. Here, selected young entrepreneurs can avail themselves of numerous administrative services. Contacts with scientific, technical, and commercial specialists can be arranged, small offices can be rented at low cost, etc.

This service is limited to 2 years. Thereafter, as the firm grows appropriately, office space can be rented privately.

In future the focal point is to be the regional location of firms which were established in the Sophia Antipolis Technology Park, as well as the creation of small supplemental promotion centers which are in contact with the central promotion center.

France, like the remainder of Europe, has risk-capital firms. The new tax laws favor investment of risk capital in research and development. Unfortunately, fewer than 25 percent of available funds go to the establishment of new firms. French risk-capital providers work much more closely with the banks than, for example, is the case in the United States. Only a few of them are prepared to invest money in an innovative product without seeing a profitable business in the offing.

France certainly needs more daring risk-capital providers who would take over the middle role between business people and inventors, markets, and financial institutions.

5911

CSO: 3698/482

WEST EUROPE/TECHNOLOGY TRANSFER

S&T PARKS IN FRG: FROM CONCEPT TO REALITY

Duesseldorf HANDELSBLATT in German 12 Mar 86 pp 33-34

[Article by Guenter Keil: "Technology Centers--A Concept Becomes Reality; The United States Served as an Example"]

[Text] The facilities which have arisen over the past 2 years are variously called technology center, technology park, founder center, technology factory, high-tech center, innovations park, or the more modest industrial park--currently there are 32 such facilities which are quite frequently regarded as structurally political wonder weapons of the communities. These designations contain a reference to the image concepts held by the carriers or operators, but need to be examined for substance in individual cases.

No matter what they are called, they most certainly fall into one of the following categories:

Industrial Park: Colocation of small and middle enterprises in a complex of buildings administered by a carrier company. There is no employment policy and the branch structure which is present is manifold and there are also, as a rule, no centralized services offered to the firms.

Founder Center: Colocation of newly established enterprises which, as a rule, belong to the processing industries and engage in production-oriented services. The carrier company makes available the space and offers the use of joint office and administrative facilities as well as management, consultation, and support services.

Technology Center: Colocation of predominantly young enterprises which offer new products and processes as well as technological services and which, as a rule, require high capital input and embody a high market risk. Another characteristic is that most of these enterprises must constantly deal with high-risk technical further development and that a number of these firms have not yet reached the marketing phase. The carrier company offers the above-named services.

Research Has Priority

Research Park: A parklike industrial area housing research-oriented establishments, enterprises, or research and development departments of larger enterprises where the close proximity to an advanced school or a research facility or the quality and the positive image of the facility itself provide attractive working conditions. Central service facilities are not required; even the buildings themselves are generally constructed by the enterprises themselves in individual styles. Cooperation between the enterprises is the exception.

The great majority of the centers which have arisen over the 2 years and which are still in the planning stage belong to both groups of founder centers and technology centers, with many mixed forms existing. Quite a few things which were observed during the establishment and planning of these facilities require criticism: America's Silicon Valley and Route 128 near Boston were named as examples although nowhere in Europe do comparable conditions exist and the first step toward achieving this dream goal was frequently the identification of an empty factory building or school as a suitable location for the establishment of a technology center.

Romantic visions of young enterprises in old structures, whereby the gross underestimating of renovation and reconstruction costs have already led to many a misinvestment, although this could have been learned from foreign examples. The result: unsuitable space, missing expansion possibilities, and image of the entire structure, which transmits to the enterprise--some centers still give the impression long after their opening that this is 1945.

The financing of many of these centers is contradictory and, in part, without regard to the actual requirements: one-time investments for acquisition, renovation and development as well as for equipment appear to have been generous--in part, these investments actually purchase meaningless facilities such as technical workshops. Things look very miserly, however, with respect to financing current operating costs.

Keeping an Eye on Costs

It is surely correct to respect operating costs and to avoid unnecessary expenditures, but the quality and efficiency of a founder or technology center stands and falls with the quality of the center's management. To save money throughout means to condemn the facility to decline and misery. The savings, embarrassment, and substitute solutions observed with respect to a number of centers here (for example, parttime employees) give rise to considerable concerns.

There are said to be technology center managers who occupy themselves exclusively with planning expensive telephone facilities and personal computers for the center. It should be noted that a technology center needs its own PC about as much as it needs a concert grand piano: for the office, one needs a telex-capable typewriter which can handle the rest of the text work. The enterprises bring computers of the most varied type along with them. However,

such simulated activity can presumably act to convince oversight groups who assume that a modern thing like a technology center absolutely must have the most modern in technical facilities--in other words, a computer.

Avoiding Illusions

Illusions with regard to what can be attained sensibly in conjunction with a disregard for regional resources have led to the widespread view that so-called high-tech firms would have to locate in technology centers; this concept, for the most part, continues to identify topical sectors of information science--automatic data processing, CAD/CAM, microelectronics--laser technology and biotechnology. These are areas in which a high growth rate is suspected, something which does have some validity in the FRG average although a real center in a region which is characterized by a totally different industry, can remain without mass or results.

Those who are familiar with the level of technical development in the various branches of industry--even in, and precisely in the classical industrial areas--will not accept this limited high-tech concept anyway. Everywhere, development has always been pushed to the limits of that which is technically-economically feasible and that is why one can find projects of a high-tech character--in other words, projects using the latest technology, carrying high developmental risk and characterized by high innovation potential--even in the classical industries. Innovation in these areas is significant precisely because large and long-established markets stand ready to accept them; this is a good beginning base for establishment founders.

It would, thus, be appropriate for those responsible for existing and planned technology centers to take a more precise look at the economic structure in their region and consider whether it would not make sense to establish a technical focal point which is more strongly adapted to the industries of the region. Naturally, the specialized foci of regional advanced schools and research institutes must be taken into account. If, however, the latter alone determine the focal point in the absence of an industry active in the same field, then one will have to limit oneself to the research park concept; one cannot count on establishing enterprises in meaningful numbers.

Setting Focal Points

Thus far, there are only a few indications discernible with regard to setting of such focal points in the technical area; perhaps the most consistent are those of the Munich MTZ with its concentration on production technologies (processes and facilities) for electronic components.

A widely spread error is also the assumption that the establishment of technology centers will stimulate the establishment of enterprises which will then result in new jobs. There is certainly no such connection--something which will immediately be seen when one considers the reasons for the establishment of young enterprises, in the final analysis than the motivation of the founders. The decision to establish an enterprise is not a short-term one or a spontaneous one. One has to deal with serious and pressing plans which are influenced decisively by the availability of the necessary capital.

It defies imagination that the opening of a regional founder or technology center, which offers perhaps somewhat more favorable room rents as well as telephone and secretarial services, would represent the decisive factor in the establishment of enterprises. Newly established firms which move into such a center would have been established in any event, even if the appropriate center had not existed.

No Figures Yet on Effectivity

One should expect undisputedly positive effects and, in the final analysis, also effects creating new jobs, on the part of such facilities as a result of the effects of a successful enterprise: If it is possible to bring the new enterprises of a center, particularly through consultation and active assistance in management with a clearly low insolvency quota, through the first 5 years--as has been shown in starting up an enterprise otherwise--and if they can also be helped to undergo stronger growth, then there is a net gain in jobs which can be quite considerable.

Unfortunately, no one can as yet quantify this effect which is decisively and almost exclusively dependent on the quality of the center's management. The necessary data will be available at the earliest in 4 years and the research institutes which are engaged in evaluating it are not to be envied in their tasks because of the many influence factors. Nevertheless, it seems permissible to begin with the described positive effect of well-run founder and technology centers. The various enterprises expect the following advantages to accrue to them from locating in a founder or technology center:

- a. reduction of costs in the first years through using price-advantaged services and communal facilities;
- b. expansion possibilities within the center without having to move to a new address;
- c. image improvement with respect to customers and credit institutions by having a "good address" also brought about by strong selectivity on the part of management in selecting candidates;
- d. consultation and contact brokerage--particularly with respect to credit institutions--on the part of management;
- e. in individual cases, buildup of commercial relationships with other enterprises in the center. In this case, it is particularly the opportunity for cooperation as a complementary supplier in a specialized technological area; the prerequisite is an appropriate selection policy on the part of the center.

If, in conjunction with this type of centers, the word "consultation" is heard, one should depart from all visions of a comprehensive and many-sided technical picture of an advisory system: The matter continues to be only one of money. This is what young firms do not have enough of.

The Center Manager as a Responsive Partner

The consultation deals with all questions as to how one can get more credit from banks, how orders can be prefinanced, how one can save on taxes, how one can keep producer liabilities low, how one can introduce controls, etc. That is why it is also so important that the most important discussion partner for a young enterprise, the center manager, maintain the best contacts with decisive persons in regional banking circles or possibly also with respect to venture-capital associations. To the extent to which it is necessary, the founders of the enterprise will provide their own technical consultation--after all, they themselves are specialists.

Effect of Founder and Technology Centers Upon the Regional Economic Structure: If one disregards the Silicon Valley visions which are heard from time to time, then the effects of founder and technology centers are not at all unrealistic in their hopes: A well-located modern building complex, which houses young technical enterprises can very well become an orientation point and signboard for a communal economic policy which is oriented toward innovative young enterprises in a very short time. The symbolic strength of such a facility must not be underestimated.

However, this immediately indicates that these important image advantages are largely given away when, for reasons of false economy, older deteriorated factory buildings, located in appropriately unattractive surroundings, are designated to be technology centers. Essential prerequisites for success are, in addition to the previously mentioned very important externalities, also the existence of a concept and strategy reflecting regional peculiarities, and the presence of effective management, which cannot be mentioned enough times, a management which, through personal format, specialized competence, and joy in action, becomes the motor of the facility.

If one has a lucky hand in solving this question, then such a center can indeed take on an economic policy significance and a key function which is far greater than the meaning and economic force of the establishments which work in it:

- a. For one, the center can open up a new area of activity for industrial location policy in the direction of technologically oriented young enterprises and can contribute to the creation of permanent jobs having higher qualifications.
- b. For another, it can take on a number of useful tasks--for the sake of sensibility, this should be done in cooperation with the chambers of commerce--such as the holding of seminars for regional industry on topical themes of new technology, information transmittal (use of data banks), innovation management, or marketing.
- c. Finally, such a center can unite, in addition to producing enterprises and technical services firms, important consultation facilities and professional people under one roof--for example, the technology advisory office of the Chamber of Commerce and Industry or independent professional technology

consultants, tax consultants, patent attorneys, or the external office of a venture-capital society--all things which could result in additional regional significance for the center.

Location Requirements

<u>Characteristics</u>	<u>Founder Center</u>	<u>Technology Center</u>	<u>Research Park</u>
Research facilities		X	XXX
Consultation facilities	XX	XX	
Availability of qualified employees	XX	XXX	XXX
Pleasing, modern buildings and surroundings	XX	XXX	XXX
Proximity to customers	XXX	XX	
Subsidized rents	X	X	
Possibility to house firms even with environmentally detrimental emissions	XXX	XXX	XXX
Center management with			
Technical background	XX	XXX	
Business/financial background	XXX	XXX	
Close connection between the center management and banks and venture-capital companies	XX	XXX	

X = favorable influence, but not essential.

XX = desirable.

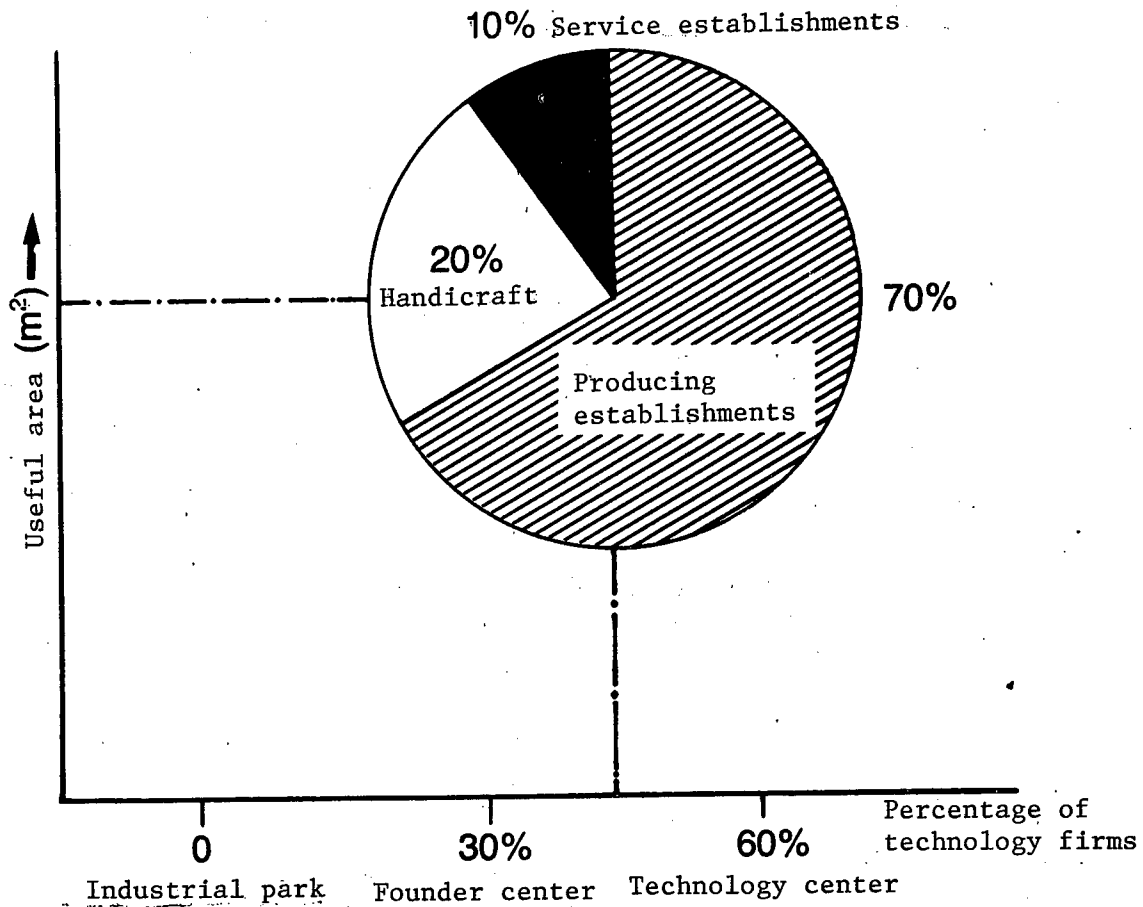
XXX = necessary.

A Special Problem for Community Politicians

A special problem confronts the community politician and the economic expert in so-called peripheral regions which would have a special need for the positive influence of flourishing technological centers, but present particularly unfavorable prerequisites for their existence. First, there is no reason why plans for founder or technology centers in weak structural regions should be generally designated as unrealistic and hopeless. The very breadth of the possibilities of solution variations should make it possible to establish facilities in structurally less advantaged regions in a meaningful manner and to operate them successfully; these facilities would take on young technical firms and provide them with better survival chances in the early years and could offer them more favorable growth conditions. The large possible multiplicity of solution variations can be described with three parameters.

1. Determining the character of the facility between the extreme industrial park and 100-percent technology center by assigning a share to young technology-oriented establishments which can be expected to have a difficult time realizing their projects.
2. Determining the size of the facility.
3. Determining the percentage relationship between producing enterprises, artisan establishments, service facilities, and consultation facilities.

Example of Concept Involving Communal Enterprise Center



An additional parameter is the already-discussed orientation of a center, and its producing enterprises--toward a specific technical focal point which should be oriented toward the industrial structure in the region. The chart shows an example of a center defined in this way. For the disadvantaged regions, there is yet another consolation: One can repeatedly hear and read in commentaries and articles that the main purpose of technology centers was to facilitate the entry into independence as entrepreneurs for graduates of advanced schools and to, thus, achieve a strengthening of the technology transfer from research facilities to industry.

Several Advanced Schools

Connected with this was the assumption that technology-oriented enterprise founders predominantly originated with advanced school institutions and--continuing to follow this logic--the demand that the location of a technology center had to be in close proximity to one or several advanced schools so as to provide an adequate number of enterprise founders. Those community politicians who also contemplated the establishment of a founder or technology center even though no university was located within the walls of their city earned only sympathetic shakes of the head.

The consolation for these buergermeisters who lack an advanced school now lies in the fact that the theory about the decisive role of academic young founders has nothing to do with reality. Even in a city like Berlin, which is amply supplied with advanced schools and research facilities, only roughly one-fourth of founders of innovative technical firms originate with such research institutes, as has just been shown in an investigation. One can determine an even lower share if one examines the first results from the nationwide model attempt entitled "Promotion of Technology-Oriented Enterprise Foundings (TOU)," conducted by the Federal Ministry for Research and Technology: 16 percent of those establishing enterprises came from university institutes and another 6 percent from state research facilities--and this is a thoroughly respectable share. Naturally, the predominant share of technology-oriented enterprise founders originate from the economy, have a number of years of industrial experience, and quite frequently also experiences in marketing and distribution. In other words, these persons bring both their experiences from their former advanced school training but also their experiences from industrial development and production with them.

There Is No Closed Season

One can only be happy and relieved with respect to this fact because during the critical development phase of a technical enterprise there are no practice phases for learning entrepreneurship, no closed season on the part of the competition, and also no discount from the banks. On the contrary: This phase is frequently characterized by pressing lack of capital, technical developmental problems which lead to delays and cost increases, the tightest of personnel resources and acute shortages of time with respect to fabrication of the product and its introduction to the market.

These entrepreneurs cannot afford any management errors which could be utilized by the competition. No wonder then that by far the most of the enterprise founders take this step only after gathering thorough experiences in practice.

However, this reveals the alleged necessity of having an advanced school at the location of the center to be a fable. The base from which technology-oriented enterprise founders originate is the industrial economy of the region, particularly industry which engages in technical development itself. If this fertile soil is present in adequate strength, a technology center can prove its justification for existing. If, on the other hand, it is lacking, then no advanced school will help.

Decisionmakers who are contemplating the establishment of a founder or technology center today can, therefore, be given the following advice:

- a. first make an analysis of the industrial surroundings (avoiding agreeable opinions) and estimate the utilization of such a center;
- b. in the event of positive results, seek a broad basis for a carrier company (community, a chamber of commerce, industry, credit institute);

- c. clarify contribution possibilities (land) and make a financing plan; plan for a capable fulltime management; avoid comparing any rent subsidies with customary local rents for office space;
- d. gratefully reject all offers of defunct factory buildings, schools, warehouses, etc., even if they are gifts;
- e. take suitable parcels of land into close consideration; consider subsequent expansion possibilities;
- f. look for the suitable man (or the suitable woman) for the post of center manager now; this person must take over the planning and must help create the center decisively;
- g. collect information on the experiences of other facilities (very helpful: study of video films made by the Research Ministry on Dutch founder and technology centers--they can be borrowed from the ISI of the Fraunhof Co. in Karlsruhe);
- h. determination of the entire concept, design the new construction as elegant but spartan (avoid excessive workshops, equipment, etc.);
- i. begin the acquisition of interested entrepreneurs;
- j. begin construction;
- k. arrival of the first enterprises; opening festivities; invitations for those politicians who actually helped break out contributions;
- l. operate the center on the principle: good pay for good center personnel (exactly two people), provision of services only in cases of specific need and services offered at full cost, building up and maintaining a contact network between the center and the surroundings;
- m. acceptance that such a facility, if it repeatedly takes on young enterprises and lets go mature and stabilized enterprises, can exert a very positive influence and a financially measurable influence and that the fact that total costs cannot always be completely covered by income can therefore be accepted.

Manifold Possibilities

The above-described manifold possibilities of goal-setting and establishment of centers for young enterprises also allow peripheral regions to provide developmental perspectives for any establishment potential which exists in their area and, at least, to largely prevent the departure of qualified citizens. These regions will likely only rarely have a 100-percent technology center, but there can be numerous facilities below this level which are adapted to regional resources and can clearly upgrade the location.

In addition to the establishment of such centers for young enterprises, the disadvantaged regions can attempt to improve at least some of the location requirements listed in Table 1. This is particularly true of the factor entitled "Availability of Qualified Personnel." Everything which is suited to develop qualified personnel through training or postgraduate education, to keep them or even attract them through convincing measures taken in the direction of improving the quality of life, is also of direct benefit to the establishment and growth of young innovative enterprises.

5911

CSO: 3698/483

WEST EUROPE/TECHNOLOGY TRANSFER

FRG MILITARY, CIVIL RESEARCH CENTER: AMMUNITION, ARMOR, PLASTICS

Duesseldorf HANDELSBLATT in German 26 May 86 p 17

[Text] With the establishment of the Technology Center North (TZN) at Unterluess along the Lower Saxony zone border, the land government has, for the first time, attempted to unite civilian and military research in one institution, according to economics minister Breuel, as she pointed out at the cornerstone-laying ceremony.

Mrs Breuel said one could not designate civilian research as good and military research as bad. Because the Bundeswehr cannot exist without military research. There is no north-south decline in defense-technical research in the Federal Republic, said state secretary Prof Timmermann of the Federal Ministry of Defense. North Germany is said to profit from research and development expenditures of the Federal Republic in this area which, by the way, only operates in a complementary manner with respect to the private economy, according to the distribution of the gross national product.

The Rheinmetall GmbH Co. of Duesseldorf is the largest corporate entity participating in the TZN (40.1 percent). The company, which employs 1,100 employees, fabricates ammunition and tank superstructures at Unterluess. The TZN, which is to be completed by fall of 1987, will employ around 150 employees during its initial phase and later, in the opinion of the land government, around 200 people will be working there. Furthermore, a promotional association which encompasses 20 North German medium-size enterprises in addition to the Lueneburg Chamber of Industry and Commerce (including establishments from the regulation instrument, measuring instrument, and control instrument technology areas, from the plastics industry, and from the engineering industry) has 35-percent participation in TZN. The remainder is held by the North German Landesbank through a subsidiary.

The Rheinmetall concern, which has a worldwide turnover valued at DM 2.8 billion, of which around two-thirds are in the civilian area, is spending 6 percent for the working up of technical know-how in 1986, according to Dr Hans U. Brauner, the chairman of the board. Since research and developmental costs as well as the risks are rising steeply, particularly in the defense-technical area, one is grateful for the TZN joint project. It is known that Land Lower Saxony has provided a loan of DM 100 million over 15 years at a reported interest rate of around 6 percent.

5911
CSO: 3698/483

WEST EUROPE/TECHNOLOGY TRANSFER

SWISS VIEW LESSONS, RISKS, POSSIBILITIES OF TECHNOLOGY PARKS

European Models, Successes

Bern TECHNISCHE RUNDSCHAU in German 11 Mar 86 pp 78, 82-85

[Article by Juergen Allesch, manager of TU-Transfer, Technical University of Berlin; first two paragraphs are TECHNISCHE RUNDSCHAU introduction]

[Text] In November of last year TECHNISCHE RUNDSCHAU, together with the Bern Chamber of Commerce, held a symposium on the topic of "Technology Parks." On the occasion of this well-attended meeting in Bern, speeches on the significance of promoting technology were given by government counselor B. Mueller and P. Borgeaud, president of the Brothers Sulzer Enterprise Concern Management, and by the president of the Association of Swiss Machine Industrialists, Winterthur. Lessons from existing technology parks were drawn by J. Allesch, manager of TU-Transfer, at the Technical University of Berlin, by Ch.J.J. Zijderfeldt, director of the Econova AG in Zurich, and by P.Y. Tesse, Chamber of Commerce and Industry of Lyon, France. Possibilities and limitations of technology parks were addressed in conclusion by Prof Dr W.A. Kewinig, the senator for science and research, Berlin. The subsequent discussion dealt primarily with sounding out the chances for technology parks in Switzerland. The editors have compiled the essential items from this symposium.

The FRG has eight technology parks. Thirty are in the planning stage and at least 17 are under discussion. In the United States, at Stanford University, the first of today's 150 "science parks" was established in 1948. In the United States one-half of the parks have since then failed and about one-fourth of all enterprises attached to them have proven to be flops. The Netherlands and Great Britain began years ago to develop their own concepts in the American example. In the Netherlands there are around 45 technology parks today, another 100 are in the planning stage. In contrast to the Netherlands British technology parks are found mostly in the immediate vicinity of advanced schools and are more like "science parks." France also has numerous technology parks which are being established or are already in successful operation.

The current situation with respect to establishment centers and technology parks in the FRG is characterized by an absolutely stormy development. The opening of the "Berlin Innovation and Founder Center," jointly conceived by

the Technical University of Berlin and the economics senator, in November 1983 marked the beginning of a boom: Numerous technology parks and founder centers have begun operating in the past year or are in the planning stage.

The Federal Republic is thus at the beginning of a development which has progressed much further in the other industrial nations such as the United States and Great Britain.

The establishment of new enterprises with new technologies in the area of advanced schools is not only an effective means of disseminating and implementing new technologies, but, at the same time, constitutes a suitable means for the creation of more innovative undertakings and future jobs. Simultaneously, in the advanced school environment, scientific know-how is accumulated.

Starting out from the Anglo-American examples, specific forms of promoting technology-oriented enterprise establishment have developed: through the provision of infrastructure, rooms and operating space, and the concomitant support promoting the development activity of technologically oriented enterprise establishment. The following infrastructure concepts are recognized:

The research park, in which new enterprises or off-site departments of large firms conduct research and development in relatively close cooperation with a nearby university or research facility and in which prototype fabrication but not mass production is permitted. These facilities are characterized by a particularly high degree of selection.

This concept is, for example, followed at Heidelberg where young firms from the biotechnology and genetics area, as well as those engaged in medical technology, engage in research and development and are expected to profit from the proximity of such renowned research facilities as the University of Heidelberg, the German Cancer Research Center, the Max Planck Institute of Nuclear Physics, Cell Biology, and Medical Research, as well as the European Molecular Biology Laboratory.

The founder center or innovation center which, comparable to the American and British "incubator schemes," wishes to offer new technology-oriented enterprises optimum survival and development opportunities through a comprehensive spectrum of services, the proximity of advanced school institutions, and through ties with the local and regional innovator network. Essential selection criteria are the age of the establishment and the activities it engages in in advanced technological areas.

An example of such a concept is the technology center in Stuttgart-Pfaffenwald which is to start its work shortly. Here, the university is contributing use possibilities of equipment and laboratory facilities; other renowned research facilities are ready to support the young enterprises. This and a coordinated widespread spectrum of services for the facilities is supposed to create the suitable "founding climate." The strong commitment of banks in the carrier organizations which make risk capital available to the young enterprises is interesting.

The technology park represents essentially a new form of industrial settlement. Existing enterprises in "innovative" technological areas are offered an attractive environment and the proximity of research facilities. In this type of facility, the selection requirements levied upon establishments are relatively small and the target groups less closely defined.

Such a concept is being followed by the enterprise park at Kassel which began operating in the summer of 1984 on 156,000 m² of area. The "soft enterprise" is particularly well suited to characterize the establishment of technology-oriented enterprises in the FRG. According to Bullock, the following are the characteristics of a "soft enterprise":

- a. market entry through orders and developmental activity;
- b. staged development of the enterprise "product" from qualified consultation services through the production of a standardized product;
- c. the tendency that specific tasks for specific customers are performed on the basis of individual long-term contracts and that less emphasis is placed on production for a general or relatively broad market;
- d. in the "hardening" developmental process, the individual stages overlap for operational-economic reasons;
- e. they are concentrated on a small customer circle in an area of high technological requirements (market niches); for the most part, these customers are other enterprises and/or state facilities;
- f. many founders tend to sell themselves to their principal customer in the event of strong enterprise growth instead of devoting more effort to the management of a growing firm.

The working methods of a "soft enterprise" make possible a process-oriented growth into management functions and economic enterprise actions and thinking. This reduces a possible risk of failure.

For academic reasons, the financial modalities of a "soft enterprise" are easier to master since the volume of finances in the initial phase is relatively low and grows at a slower pace. On the basis of individual contracts with specific customers, there is even the possibility of calculating profits and include the acquisition of special equipment. Similarly, there is a possibility, by hiring temporary help from the university and by using university laboratory facilities, that operating costs can be substantially reduced.

Characteristics of a "Soft Company"

Development stages of a "soft company" are as follows:

- a. start with research-oriented consultation services;
- b. development on orders from a specific circle of customers;

- c. concentration on a narrow circle of customers with high technological requirements (enterprises and/or public sector);
- d. expanded circle of customers;
- e. development of standardized products for various principal customers;
- f. production for the general market.

The dominant target group of establishments in the Federal Republic are young enterprises in new technological sectors. An outstanding characteristic of these firms is the fact that they are oriented toward the international or at least the supraregional market from the very beginning. However, the young enterprises rarely have the necessary capital, contacts, and partners as well as the required know-how in order to achieve a problem-free access to international markets.

Therefore, founder centers and technology parks must in no event limit themselves to providing the infrastructure conditions, but must offer their firms active marketing support and intensively initiate international connections. In any event, the experiences gathered in the United States, in Great Britain, and in the Netherlands have shown that innovation centers can provide young enterprises with effective support which is sometimes vital to survival in the establishment and consolidation phase--a factor which has manifested itself in a substantially lower liquidation rate pertaining to young firms joining innovation centers. The positive influences of such facilities upon the economic development of newly established enterprises must, therefore, not be underestimated.

The effect of innovation centers on the economic development of young technology-oriented firms can be characterized as follows:

- a. support/consultation,
- b. provision of service,
- c. information,
- d. contacts,
- e. publicity work,
- f. marketing.

The precise knowledge of the specific characteristics and requirements of enterprise establishment facilities is important to the development of a promotional instrumentality and service spectrum for newly established enterprises which are oriented toward a special situation. Of equal importance is the creation of a favorable innovation climate and a creative environment. Toward this end, the following factors are important: proximity to research institutions, favorable transport conditions, developed regional economic promotion,

subcontractor enterprises, qualified personnel, as well as a good standard of living, possibly in the form of cultural offerings or attractive settings in the country.

Innovative factors:

- a. medium-size and large establishments,
- b. universities and research facilities,
- c. public transportation,
- d. banks,
- e. venture capital,
- f. cultural infrastructure,
 innovations network.

Innovations network:

- a. management and director personnel,
- b. bankers,
- c. venture financiers,
- d. advanced school teachers,
- e. advanced school graduates,
- f. scientists,
- g. artists,
- h. administrators,
 innovation climate.

Technical University of Berlin

The Technical University of Berlin has been working on strengthening cooperation between the economy and science since 1977. For this purpose, a technology-transfer facility was established. Within the course of these activities in technology transfer, specific transfer measures were developed and introduced. These transfer measures can be categorized at the following working levels:

- a. information transfer,

- b. technology transfer,
- c. personnel transfer,
- d. further development,
- e. enterprise establishment.

As a "knowledge transfer program," these five working levels form the foundation for the work of the technological transfer facility at the university.

Information Transfer

Information transfer is one of the central tasks of the transfer of knowledge and technology. In addition to information on the university-provided services and their offensive marketing, as well as the elimination of information deficits on the user side, this working level also has a superimposed advanced school and science policy dimension: This involves the dissemination of the research conducted at the university to the broad public through information brochures, research information bulletins, exhibits, and trade fair presentations.

The information brochures and the "Berlin research market" data bank offer enterprises some 700 usable research results in the form of new products, procedures, and services.

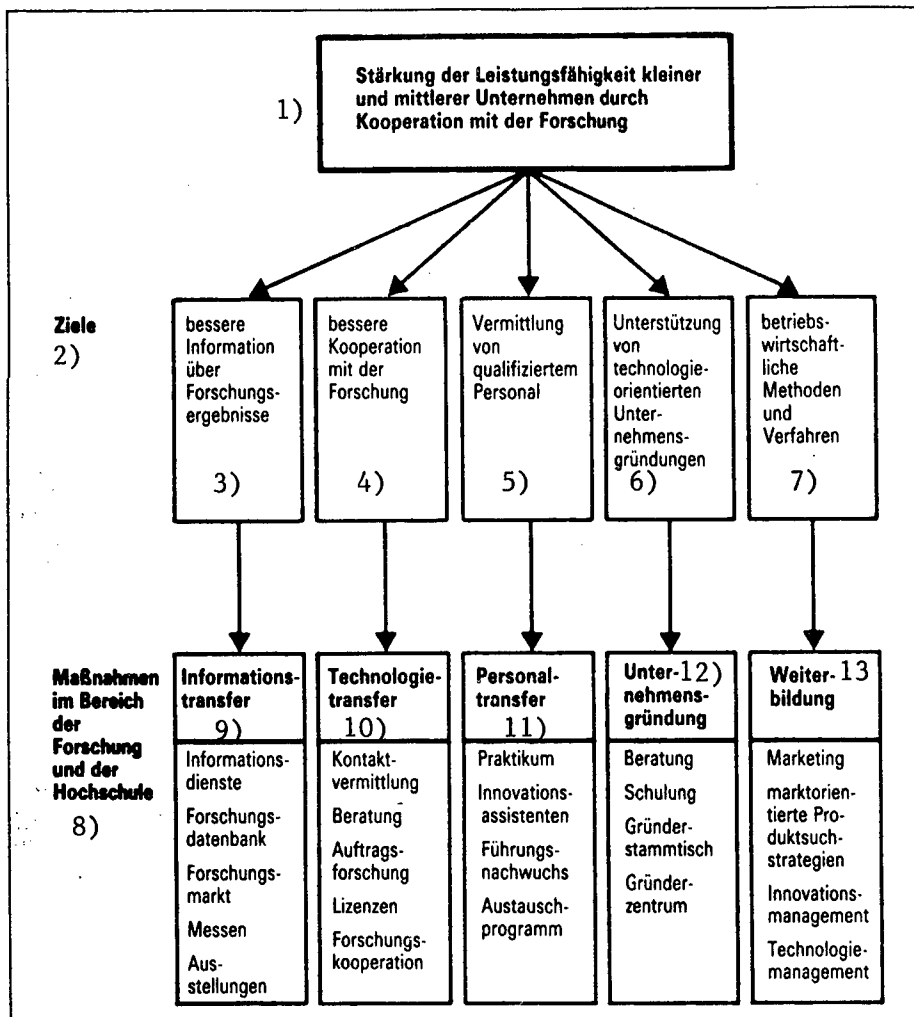
A special role in the marketing of the university is participation at an innovation or industrial fair. In the FRG the Hanover Trade Fair with its "research and technology" exhibit hall has become a national presentation ground for a large number of German universities and specialized advanced schools. These specific items of information for the economy are designed to promote the economy's willingness to undertake stronger cooperation with respect to research and development with research institutions--in other words, the actual technology transfer.

Technology Transfer

By this is meant the initiation, provision, and support of specific cooperation projects between advanced schools and external partners in the area of research and development. This involves all contractual and administrative conditions which present problems to small and medium-size enterprises, particularly with respect to short-term small cooperation projects. In past years some 700 cooperation projects were undertaken. These had as their goal the improvement of products and procedures in various enterprises or their new development at the universities.

Personnel Transfer

Personnel transfer is the most efficient form of knowledge and technology transfer because it is person-oriented. In this area, however, small and medium-size enterprises require special help in order to overcome existing obstacles and bottlenecks.



- Key:
1. Strengthening the performance capability of small and medium-size enterprises through cooperation with research
 2. Goals
 3. Better information from research results
 4. Better cooperation with research
 5. Placement of qualified personnel
 6. Support of technology-oriented establishment foundations
 7. Enterprise-economic methods and procedures
 8. Measures in the area of research and advanced schools
 9. Information transfer: information services; research data bank; research market; measuring; exhibits
 10. Technology transfer: arrangement of contacts; consultation; order research; licenses; research cooperation
 11. Personnel transfer: practical training; innovation assistants; future managers; exchange program
 12. Enterprise establishment: consultation; training; founder regulars; founder center
 13. Further development: marketing; market-oriented product search strategies; innovations management; technology management

Personnel transfer in an organized form represents a developmental field. The technical university transfer facility, as the first German transfer facility, has had great success with respect to activities in this area and other transfer facilities have begun to place qualified graduates in the economy.

Within the framework of a special program, the Berlin senator for economy and labor has added 40 percent per year as a bonus to the gross salary of graduates. In the good 2 years that the program has been operating, more than 200 graduates were placed in jobs.

Further Development

Rapid technological change confronts the university with the task of developing continuing professionally based scientific training. The employment of new technologies and the advances in scientific knowledge in research necessitate qualification efforts. Continuing specialized education should be the responsibility of the professors and scientists involved.

Establishment of Enterprises

This work area is increasingly falling to the advanced schools. The establishment of new enterprises with new technologies in the environment of the advanced schools is not only an effective measure to disseminate and implement new technologies, but simultaneously, also a suitable means for the creation of innovative enterprises and future jobs. At the same time, scientific know-how accumulates in the advanced school environment.

The establishment of enterprises by scientists is a new area which has arisen from the practicalities of transfer work. The support capabilities of the technical university transfer facility have been gradually expanded since 1979 and consist essentially of the following measures:

- a. operational-economic consultations during the initial enterprise conceptual stage;
- b. seminars and workshops on motivation, information, and continuing education of those interested in establishing new enterprises;
- c. provision of use possibilities pertaining to university laboratories, instruments, and room facilities (for pay);
- d. communication through the founder regulars (umbrella facility: senator for economy and labor). These meetings involve usually 60 to 80 technology entrepreneurs who use the occasion to exchange experiences and information. The contacts tied to the meeting of regulars run to direct business contacts and joint project planning.

The Berlin Innovation and Founder Center

The support possibilities for founders of establishments were gradually expanded by the technical university transfer facility and cumulated in 1983 in

the establishment of the Berlin Innovation and Founder Center as the first innovation center of this type in the FRG.

Further development of the Berlin Innovation and Founder Center takes place via the facilities of the technology and innovation park (TIP). On 14 June 1985 the first medium-size enterprise moved into the TIP. It engages in development, production, and dissemination of testing systems for construction materials and other materials. In the meantime, the technology park houses 7 enterprises in its area of 17,000 m² and these enterprises employ a total of 330 persons. In addition to technology-oriented firms, the TIP will house research institutes of the Technical University of Berlin, private research institutes, as well as a second founder center. At the same time, the Nixdorf firm will establish a production facility in the area. The immediate proximity of this enterprise permits the anticipation of innovative and mutually supporting impulses. Cooperation between research facilities and enterprises in the area of the technology park is expected to develop a positive climate which will also show its effect beyond its borders.

This, thus, realizes a concept which is commensurate to the innovation location of Berlin with its largest concentration of various research facilities in the FRG and which, at the same time, helps to further develop the image of a modern innovations-oriented city.

Bern First Technology Project

Bern TECHNISCHE RUNDSCHAU in German 11 Mar 86 p 80

[Article by Dr Bernhard Mueller, government counselor; first paragraph is TECHNISCHE RUNDSCHAU introduction]

[Text] Within the framework of the third economic promotion program, the Bern government will present guidelines for the structure and regional policy through the next decade. The first specific steps have already been made: The government has established a planning group entitled "Technology Center Bern." As early as this year the project realization is supposed to be initiated. The first outlines are already known.

The most recent economic development is characterized in an unprecedented manner by technological change in the Canton of Bern. Through the introduction of new technologies, the necessity and significance of innovations in all branches, particularly in industry, however, has risen markedly. This has caused the conditions under which development, transfer, and application of new technical, commercial, and organizational findings are to occur, into a central interest area with respect to a future-oriented economic policy. In this connection, the government asked professors at the University of Bern to examine how the existing bottlenecks with respect to innovation can be specifically eliminated today. The scientific studies by Prof Mey and Prof von Weizsacker resulted in a broad and very positive echo. Three final conclusions can be drawn from these studies from the political standpoint:

a. Economic and technological promotion bring about, apart from specific state measures under the slogan of improvement of outline conditions--primarily appropriate efforts on the part of the private economy and its institutions.

b. Future-oriented economic and technology promotion requires a broadly based concentrated action on the part of all participants which requires both the financing of innovation (availability of risk and venture capital) as well as the technological aspects in the closer sense of the word (training, research and development, know-how transfer).

c. Efforts to achieve efficient economic and technology promotion have real success only if they are supported by the appropriate branch of the economy and its institutions fully and if they are carried by that body.

These final conclusions determine the concept for future economic and technology promotion in the Canton of Bern.

The first concrete steps have already been taken: The government counsel has established a project group entitled "Technology Center Bern." It is composed of representatives of the private economy, its institutions, as well as of professors and directors of the university and the School of Engineering. This project group has the task of specifying an existing proposal for a technology center in Bern. The first rough outlines of the technology center can be described as follows:

a. The Technology Center Bern is not supposed to be a purely state organization, but one which is carried by all involved circles and particularly by the private economy as a mixed economic institution.

b. The Technology Center Bern is not supposed to consist of a so-called park, but, within the framework of a strongly decentralized structure, is expected to have at its disposal highly specialized consultation facilities to be created by our university and our School of Engineering as well as a coordination organ.

c. The goal of the Technology Center Bern lies not in the promotion of a given number of small high-tech firms, but in mobilizing and rendering useful the scattered available many-faceted technologically innovative findings, experiences, and facilities for all interested firms in our canton.

The planning group will make its proposals within this framework. The Canton of Bern has recognized the new challenges in the area of technology promotion and is prepared to take them on.

Swiss Prerequisites, Special Case

Bern TECHNISCHE RUNDSCHAU in German 11 Mar 86 pp 86-87

[Article by Hansjurg Mey; first two paragraphs are TECHNISCHE RUNDSCHAU introduction]

[Text] If one wishes to answer the question regarding an uncertain chance, then one must first pose the question: A chance for what? After all, a technology park must not be self-serving.

A possible chance must, therefore, be measured in terms of the probability of success of mastering this purpose. This means the ability to reach the goals connected therewith.

The answer to the question as to the chances is oriented toward economic-based values such as the number of assured and newly created jobs thanks to a technology park, the maintenance or increase of profitability, the achieved or improved income level, the halted or reversed exodus tendency, etc. In the medium or long range these values must result in maintaining or increasing the tax income as a firm indicator of general well-being.

However, this is the target magnitude of the political leadership from which the public interest in technology parks and similar economy-promoting facilities is discerned by way of technology promotion in terms of the highly placed personality of public life (however, not on the basis of technology): "Politics is economic policy and economic policy is technology policy."

Do We Need Technology Promotion at All?

What are the chances of Switzerland in this area--what are the chances in our country--of using specific technology promotion (in order to publicize the concept of "technology park") to reach a marked economic improvement? To answer this question, the individual component areas must be examined more closely:

- a. Do we desire or need technology improvement at all? Are our economic performance capabilities and our abilities in handling modern technology not developed so well anyway that any additional and specific measures (with public support at that) would prove to be superfluous?
- b. Does our country have those outline conditions which belong to the fundamentals for success in technology promotion elsewhere?
- c. What special situations would have to be taken into account in Switzerland, based on the demographic, geographic, and traditional characteristics of the country, in order to maximize the chances?

Desirability and Necessity of Swiss Technological Promotion

Before we turn to the considerations involved in the three component areas let us sketch out a very simple answer which can be dared on the basis of mere

observation of our environment--namely, an observation of technology-promoting measures of our neighboring Baden-Wuerttemberg: In its southern regions, the structure and population mentality of which is not so different from ours, a number of technology parks or centers were established over the past years. Another good dozen are in the planning stage. In comparison with Switzerland, Baden-Wuerttemberg has the lowest number of unemployed and there is talk of a "reverse north-south decline," which has taken place in West Germany on the basis of this deliberate set of technology-promoting measures. The simple answer could therefore be: In our similarly positioned conditions, the desired real chance is clearly present throughout, if one were only to grasp it.

(A supplemental remark in this area: Together with Austria, Switzerland is currently the only country in West Europe without a single technology park. Even under the proven maxim of letting others make the grossest mistakes first, the question of addressing "technology parks" is hardly premature anymore.....)

Some recent studies--those done by the National Research Program No 9 of the Basel Working Group for Competition Research (BAK) show a relatively favorable result with respect to number of jobs taking into account the contradictory influences of rationalization and innovation. Apart from the fact that the prognosis horizons are relatively short, it is worthwhile to consider the premises of these forecasts--"a very rapid adaptation of our industry to the new situations" and "in the event the application of new technology occurs more rapidly in Switzerland than in the rest of Europe." These premises anticipate special flexibility and rapidity particularly in technological development, which contrasts to the well-known problems involved in the training of engineers and information specialists, where the question of personnel has been pushed back and forth for a number of years whereas industry is desperately calling for those modernly educated young specialists so urgently needed in the adaptation process involving new technologies. In this respect, let it be marginally mentioned that the source of foreign specialists is about to dry up not because specialized work permits are no longer available, but because the European labor market is finally drying up with respect to technology specialists. Even the European Economic Community program ESPRIT absorbs 10,000 man-years of this tight resource, not to mention the EUREKA program and the additional DM 2.6 billion which Germany is expending for direct technology promotion in the area of informatics in addition to its program for its states.

A technology park or center is, after all, actually a facility which, according to all experiences, is capable of attracting specialized know-how with its own gravitational field and, to a certain extent, can rapidly overcome the lack of self-educated specialists. Relatively rapidly because it does not have to ply the long detour of the education system which is full of risks with respect to new training contents (but, in the long run, obviously the only way to go.)

Another question pertains to regional differences: Economically weaker regions generally profit less from technologically driven economic upswings because of unfavorable starting positions than do economically stronger regions

(detailed studies for the Canton of Bern have again confirmed these findings). The thus accented differences are diametrically opposed to state considerations, particularly in Switzerland. Technology centers can help correct these unfavorable developments since they have a geographically limited area of effect and can, therefore, be employed in locations where correction is particularly necessary (the example of South Baden-Wuerttemberg has already been mentioned).

This then presents two arguments--others could be mentioned--which justify the desirability and the necessity for deliberately used technological promotion measures in our country. After all, in both cases, these are topical open problems which cannot be solved with existing means and the solution of which justifies supplemental means, even though they have, thus far, not been among the canons of traditional and publicly supported economic promotion.

Existing or Missing Conditions

The fact that Switzerland is still a white spot on the map of West Europe with respect to technology centers has much more to do with our characteristic cautiousness and traditions than with the absence of favorable conditions. We have thus far simply not done so. Those of the unfavorable conditions, such as taxation, foreign exchange problems, nontariff restrictions, etc., are generally of economic significance without any special relevance for technology promotion. On the other hand, what becomes particularly weighty is the miniscule domestic market for advanced technology and the little readiness to give a fair chance to something new: "The prophet in his own land...."

On the other side of the coin--and it belongs clearly among the favorable conditions--we have a well-defined team spirit which, among others, is manifested in above-average readiness for militia-type cooperation. Here, the smallness of our country and the customs which have resulted from it become an advantage which is multiplied by the proximity of the user network which is at our disposal across branches and regions.

Therefore, technology promotion in Switzerland must mean the ability to play off these advantages. The best prerequisites for this are enthusiastic scenarios--well-conceived technology centers are among them.

Is There a "Special Case for Switzerland" in the Area of Technology Promotion?

It is dangerous to invoke this "special case" in the case of every problem requiring a solution. On the other hand, it is a maxim of practicality that special situations should be taken into account and measures should be adapted to them with a fine feel.

A complete list of "special case components" would be long; we present only some indications:

A Swiss is unfavorably inclined toward every central measure, or at least skeptical with respect to it. Although technology is not divisible (there is no Swiss technology or Bern technology or Japanese technology), technology

promotion is capable of division. To establish it throughout the federal structure of our country down through the regional and community level is among the absolute prerequisites to preserve its chances.

Swiss industry is absolutely small in structure with a fine gradation going into the artisan field. Appropriately, know-how is also finely distributed--its sum total barely visible or measurable. Total economic performance--for the most part by small and middle-size enterprises--and the export results tied in with that, however, prove that this sum total is impressive and bears comparison with the world standard.

Technology promotion must, therefore, begin with this potential, make it generally more useful, and stabilize it and strengthen it by tying in with technology-oriented research.

In a worldwide comparison with industrialized nations, we have few advanced school graduates, particularly in technological directions (engineering sciences, applied physics, informatics). In contrast, we have numerous and excellent engineering schools and outstanding professional training. All of this results in a special practical connection for the Swiss education scene which has its own advantages but also problems. Among the problems is the difficult access to topical research results which are becoming of ever greater importance in the area of modern technologies.

A technology-promoting program of Swiss make must take these differences into account and must be concerned, in first place, with seeing to it that the transition from theory to practice is accomplished on a timely basis and in a closed manner. This is a task which is virtually tailor-made for appropriately established technology centers (and is partially already being handled by existing organizations such as the CSEM in Neuenburg and AFIF in Zurich even though these organizations are little known in the industrial area and are poorly utilized).

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WESTERN EUROPE/TECHNOLOGY TRANSFER

BRIEFS

USSR BUYS MINISUB FROM FINLAND--Valmet will deliver a minisub to the Soviet Union. Valmet and the Soviet company V/O Sudoimport signed the agreement concerning the matter in Moscow on Friday. The minisub delivery is part of a diving support vessel sale that was made last December. Valmet's ship industry company will manufacture the minisubmarine for the use of the Soviet Ministry of Gas Industry. The minisub, intended for gas field use, has a maximum operating depth of 300 meters, and it makes it possible for 5 observers to work. Alternatively, a team of 2 pilots and 3 divers can work in the sub in such a way that the divers leave the vessel and carry out working dives at the depth of 300 meters. The submarine is 5.8 meters long, 3 meters wide, 3.2 meters high, and weighs 18.5 tons. At Valmet the contract is described as a considerable area conquest by the Finnish ship building industry that is investing in underwater technology. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 13 Jul 86 p 31] /9274

CSO: 3698/558

EAST EUROPE/BIOTECHNOLOGY

CSSR INSTITUTE USES BIOTECHNOLOGY TO COMBAT PARASITES

Prague HALO SOBOTA in Czech 5 Apr 86 p 5

[Article by RNDr. KAREL KUDRNA, Institute of Parasitology of the CZAS, Ceske Budejovice: They Should Not Survive the Year 2000"]

[Text] Many articles have been written on the subject: Will they survive the year 2000? But many animal species exist whose survival of the year 2000 is absolutely undesirable from the point of view of society and national economy. And parasitic worms are most certainly among them. Each year, the economic losses connected with the utility value of farm animals and their veterinary treatment reach in the CSSR alone hundreds of millions of Korunas--and we do not belong among the countries with mass occurrence of parasites.

But there are countries where parasitic worms attack an important part of the human or animal population and cause losses amounting to a billion dollars a year in a single country. Hundreds of millions of people, predominantly in tropical countries, are suffering from schistosomosis, a sickness caused by the liver fluke *Schistosoma*; the same applies to filariosis, which causes the so-called elephant disease or elephantiasis. This is why parasitologists of the entire world have been for generations inexorably combatting the parasites. The scientists elaborated already many preventive measures and tried out dozens of cures. But a definite solution has so far not been found.

Chemotherapy is practically the only means of treating people and animals, but, in spite of being very effective, it has nevertheless one great disadvantage--it is usually applied when the sickness has already developed. This means in a period when the parasites have already caused extensive damage and the sickness has manifested itself by characteristic clinical symptoms. A lot is therefore expected from the research concerning vaccination possibilities.

The Parasite Has a Headstart

The Czechoslovak scientists are not neglecting these endeavors either. On the contrary; at the Parasitological Institute of the CZAS for example, we are creating conditions for a practical realization of the results of

basic research. Vaccination against parasitic worms is however much more complicated than vaccination against bacterias or most of the viruses. The situation could be compared to the problems relevant to the vaccination against influenza viruses which are constantly changing their antigen structure.

Parasitic worms have on their surface a whole line of proteins (antigens), to which the host's immunity system reacts. Unfortunately, these antigens are not stable. From the moment of the invasion, i.e. when the parasite penetrates into the host's body, it starts to develop intensively and in the course of that development the surface antigens are changing, both qualitatively and quantitatively. Or, in each development stage, the parasite has a more or less different antigenous structure. The particular antigens undergoing changes are called "specific stage antigens". They are present on the body cover of the parasite and the immunity system of the host reacts, under normal circumstances, exactly against them.

In order to make the situation even more complicated, it should be emphasized that the development of the parasite--including its antigenous changes--happens mostly much faster than the maturation of the specific immune response of the attacked organism. So that, to express it simply, at the moment when the host develops effective means of specific immunity defense--antibodies and killer cells--against one stage, the parasite has already on its surface other antigens from another development stage and the specific immunity cannot react to anything anymore.

A Compromise--the Only Solution?

When preparing the vaccines, we are basing ourselves exactly on these findings. We start the vaccination, which means that we are inserting the earliest development stage of the parasite into the host's organism. What happens then?

The parasite starts to develop as at a normal infection and causes a common illness with all the familiar accompanying features. It is therefore necessary to subdue the parasite so that it loses its ability to grow. This is mostly done by radiation. Although this procedure prevents the parasite's development, we are, on the other hand, also changing its antigenous structure, because we have employed a relatively drastic measure; consequently, the vaccine is not as effective any more. It is therefore necessary to choose a certain compromise and to look for an optimal dose of radiation in order to make the vaccine hundred percent safe; this means that we should attain the highest possible effectiveness while preventing the development of the parasite we are vaccinating with. In our country, we have used this method successfully for vaccination against lung worms of horned cattle and sheep.

Our Original Way

As it was mentioned before, for anti parasitic worms vaccination we have so far used whole parasites, either eggs or larvae, whose surface was

covered by the so-called tegument, representing a complex of the previously mentioned "stage specific antigens."

At the Parasitology Institute, we have chosen a new approach to this problem. We have applied new findings made by the transplant, tumor and comparative immunology, and the possibilities offered by modern biotechnology methods. These specialties teach us that mammals, birds and also earth worms have, besides others, a group of antigens characteristic for each given species. These antigens are on the surface of each cell of the whole organism, so if we want to immunize against a given kind, we can take cells from any part of the body. The presence of antigens, specific for the given species, in the tegument of the parasites lead us to the idea to use for vaccination against worms cells from the interior of the parasitic organism which also have these surface antigens. But the tegumentary antigens are not present. We assumed that should such vaccine be effective, it would have several fundamental advantages.

Considering that a parasite cannot develop from cells, a radiation would be unnecessary and the vaccine would still be absolutely safe. Based on these considerations, we have prepared a vaccine composed of interior cells of fox tapeworm larvae and under laboratory conditions we have repeatedly proven its hundred percent effectiveness.

This success on model species of tapeworms leads us to optimistic expectations in the struggle with the most important human and animal parasitoses. A lot of work is still ahead of us before we prepare and test vaccines against other species of parasitic worms relevant to health and economy. But the first step has already been made....

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ACHIEVEMENTS OF SZKFP SUMMARIZED

Budapest FIGYELO in Hungarian No 22, 29 May 86 pp 1, 6

[Article by Takacs: "At the End of the Beginnings"]

[Text] Using computer programmers' jargon, we could say the Central Computer Technology Development Program (SzKFP) is down. At its meeting last week the Council of Ministers officially cancelled the program which had been started 15 years ago and, in practice, was functioning until the end of last year. Since January of this year, it has been superseded by the Economic Development Program for Electronics, under whose aegis state organization work for domestic computer technology development will continue.

A decade and half in this field of endeavor is tantamount to historical perspectives. In our country, computerization had a late state. Up until the late sixties it was slow and painful. In 1971 our government launched the Central Computer Technology Development Program with the aim to catch up in the manufacture and application of computer technology and to coordinate research and development efforts. Ever since then we have been wondering just how far we have fallen behind countries with highly developed electronics technologies and we must realize that, except for some partial facets, the technological gap at the top has "regenerated." That is how, in spite of the foregoing, the SzKFP was--especially in the beginning--playing a key role in the country's computerization, in the adaptation of the so-called third generation production technologies, in the training of skilled workers and in the building of an R&D-manufacturing-service system. However, our competitors were able to make greater capital investments in computer technology development and could devote a larger proportion of their higher per capita national product to this purpose.

Fifteen Years

During each of the various phases of the program that spanned the period of the three 5-year-plans, emphasis centered on a different area. At the time of the 4th 5-year-plan the aim had simply been to establish and disseminate computer technology culture, with special attention to instruction and skilled worker training, as well as to create a computer manufacturing industry in those precision-mechanical and electronics enterprises which seemed most suitable for the purpose. Between 1976 and 1980, emphasis

began to shift toward application. Computerization was expected to improve enterprise organization and productivity, to better the husbandry of labor, materials and energy, and to bolster scientific research and technological development. Computerization also improved government record keeping and information systems and, at the same time, computer manufacturing had to be ready not only to satisfy domestic and socialist demand, but also to produce for a growing capitalist export market. In the course of the last 5 years steps taken by SzKFP were aimed at the creation of complex applicability conditions for the systems, tools and methods of computer technology, and in 1983 they announced the "socialization" of computer technology. They worked in cooperation with the CEMA countries on the solution of their problems.

Who Produces What?

Fifteen years ago we had practically no computer industry. In 1970, the total output was a mere 74 million forints, while in 1985 the industry, by now employing 7,000 persons, produced a total volume of between 9 and 12 billion forints, about three-quarters of which went for export. By the way, it is difficult to quote exact figures because there is an ever growing proportion of computer components built into office machinery, precision instruments, machine tools, etc.

The largest producers of computers are Videoton as well as KFKI (Central Physics Research Institute) or, more precisely, the Computer Technology Research Work Association, which produces the TPA machines developed by KFKI. To shed light on the differences between manufacturers: Videoton produced 63 percent of the total 35-44 billion forint computer industry output of the 6th 5-year-plan, 28 percent was manufactured by five other plants: MOM, Vilati, Telefongyar, BRG and Orion, with others turning out "the rest."

Beside computers, Videoton also manufactures large quantities of line printers and display screens, MOM makes floppy disks, the Telefongyar produces teleprocessing equipment. Typical figures from the last few years: quite a few enterprises are engaged in microcomputer production, of which 600 million forints worth was made in 1983, 1.6 billion in 1984 and 2 billion this past year.

Delayed Retirement Age

In 1970 only 150 computers, a variety of Western models, were in operation, mainly in research and development institutions.

By the end of last year the total value of our computer stock exceeded 30 billion forint, 2,800 so-called universal--small, medium and large output--computers and 17,000 microcomputers were owned by our enterprises and institutions. Six-thousand agricultural organizations--80 percent of the total--do their own data processing or have it done by others.

It was not until 1982 that the computer technological application branch received a separate heading in our statistics. Last year 75 enterprises

and cooperatives, and 1,600 small organizations falling into this category billed their customers 7.7 billion forints for software, data processing, organization, etc. The fees for computer services (e.g., data entry and data processing) have come down in the last few years, while the cost of mental work--especially in 1983-1984--increased considerably. If we figure that this type of work is performed by the enterprises within their own means and for their own purposes and if we want to give it a monetary value, then the total approximates 18 billion. The major portion of computer capacities continues to be devoted to managerial and registrative data processing, and only one-fifth to production and assembly line control and to engineering.

Our domestic software industry has exported 1.14 billion forints worth to capitalist countries in the past 5 years.

Computer purchases did not stop even during the heavy restrictions imposed on capital investments. They allocated 1.3 percent of total capital investment to this technology in 1981, and 2.5 percent in 1985. With less credit than budgeted--SzKFP's preferences and special purpose credit allocations had meanwhile ceased--they purchased hardware decidedly out of enterprise assets--approximately 17 billion forints in 5 years--which exceeded previous forecasts by about 40 percent.

These figures may look good on paper, but the fact remains that our domestic stock of computers is obsolete. The ratio between net and gross value is around 50 percent. The microcomputer boom of the last few years helped to extend "life expectancy" somewhat, but it still holds true for most of the medium and large size computers--one third of them completely written off--that they are being used to the outermost limits of their useful life. Amortization time for the machines is 6 years, but their technological obsolescence is even faster. A large proportion of basic application is handled by third generation--i.e., obsolete--computers, which should have been "retired" a long time ago.

Our table showing changes in computer investments indicates that in our stocks of computer hardware the proportion of domestic vs. convertible imports has been continually on the increase. The reason for this, on the one hand, is a much stronger domestic computer technological production and, on the other hand, the unsatisfactory quality and prices of products imported from socialist countries, limited capacity shadow prices, shortcomings in software supply, as well as the fact that in the course of the past 3 years microcomputers have arrived in this country to the tune of about 1 billion forints from capitalist nations via tourists and through internal trade.

Microcomputer Metamorphosis

The appearance on the scene and growing popularity of microcomputers undoubtedly indicates a new configuration in computer technology. Their number has doubled in our country every year in recent times, and supply is quickly changing too. In 1982 the majority were the VT 20's made by Videoton; 1983 and 1984 were the years of the Commodore 64's rather

questionable conquest. Last year saw the beginnings of the "surge" of the IBM compatible personal computer and a great majority of our institutions these days are buying nothing but the latter. The performance of these professional machines, in contrast to the Commodore 64, meets the general requirements of small and medium size enterprises and the fast decline in their pricing has also considerably increased solvent demand for them. Sixty percent of the IBM compatible PC's were Hungarian made. According to figures from the end of December, 17,000 microcomputers were owned by public institutions, of which 3,040 are in the so-called professional category, 1,550 in the 8-bit byte, 1,450 in the 16 bit byte and 70 in the 32-bit byte category of machines. (The designations of 8-, 16- and 32-bit bytes represent, in each case, a new "generation" in the world of "micros." With the doubling of the number of simultaneously processed bytes, the "diameter" of information flow increases greatly and so does the speed of operation.)

Unfortunately, the most advanced peripheral equipment--hard disk or Winchester storage units, laser printers--which are needed for the maximal exploitation of the central units, can only be imported from capitalist markets.

School Program

Before signing off we want to say a word about an essential element of the last "act" of SzKFP. It was intended to start that part of computer popularization in which computer technology would "filter down into the capillaries of the economy and society as well"--as was proposed at a 1983 SzKFP appraisal and review conference. In the interest of "inculcating" large segments of school age youngsters, a school computer program was started: from a state capital investment budget, so far, 8,000 personal computers have been placed in secondary learning institutions and 30 percent of the students use them regularly. Moreover, an increasing number of public primary schools are becoming computer owners also.

Hundreds of thousands have learned the basics of computer science from the educational series called TV-BASICS and from several hundred "microclubs" in houses of culture, housing developments and the people's army.

Microcomputers owned by the people and by small enterprises are estimated to number 80 to 85,000.

TABLE CAPTIONS

1. p 1. GROSS AND NET VALUE OF COMPUTER STOCK BY CATEGORY
(large, medium, small)
2. p 1. COMPUTER TECHNOLOGY INVESTMENTS
(non-socialist imports, socialist imports, domestic)
3. p 6. NUMBER OF PERSONS EMPLOYED IN COMPUTER INDUSTRY
(in thousands)

CARTOON CAPTION

1. p 6. "Our computer makes no mistakes: your check comes to exactly 31,489,474.58 DMarks!"

EAST EUROPE/LASERS, SENSORS, AND OPTICS

PRODUCTION, APPLICATION OF LASERS IN BULGARIA

Sofia TRUD in Bulgarian 17 Apr 86 pp 1-2

[Article by Mira Radeva: "Constructive Measurement of the Bulgarian Laser"]

[Text] Immediately needed and long-term production begun--linking of research institute to the factory demonstrates its effectiveness

A very old factory in Sofia, the former cardboard department of the Wood Pulp and Paper State Economic Organization, has now been converted to a modern enterprise for manufacturing laser equipment. The staff of the plant, which is under the Optika Scientific Production Combine, recently celebrated its first birthday. The staff, along with the economic management of the enterprise, has of course drawn up the balance sheet mandatory for such occasion, showing just how much the enterprise has accomplished in 1 year and how much it has failed to accomplish as yet. Even if somewhat belatedly, we also will try to sum up, with the assistance of the general director of the combine, engineer Stefan Stoilor, senior scientific associate and candidate of technical sciences, and deputy plant director Yordan Angelov.

The plant manufactures helium-neon, solid-state, and vaporized copper lasers, as well as lasers for geodetic and medical purposes. We understand that before this modern enterprise was established, Bulgaria imported such equipment and that hundreds of thousands of leva in the form of foreign exchange were spent precisely for this purpose.

This is now history. What is more, we see that one of the resolutions of the February plenum of the BKP [Bulgarian Communist Party] Central Committee has now become a reality. Not only is Bulgaria now making lasers, without which intensification of the Bulgarian economy is inconceivable; we are also solving the extremely important problem of maintenance of these lasers. It is one thing to wait for spare parts for complex apparatus to arrive from abroad (and it is no secret how costly such parts are), and quite another to manufacture them ourselves to keep our own laser products in good operating condition.

In other words, highly essential long-term production has been initiated. There is no need to look to the distant future for the effects of this production; they can be felt even today. Consider the first social result of laser production: a large number of Bulgarian-made lasers are designed for

use in medicine. We may also mention in passing, as is suggested to us by the deputy plant director, that lasers are used successfully throughout the world to perform operations for effective treatment of various diseases, including some forms of cancer. But this is a major topic in itself.

In the next few months, after the appropriate clinical tests have been performed, the plant will start production of four types of laser equipment intended for the health care system. Some of these lasers will be manufactured expressly for the USSR, at its request.

Lasers are also designed for machinebuilding. Because of their incomparable power, they have been welcomed with open arms in this sector. To give an indication of this power, it is enough to point out that a laser engine used in cutting sheet steel is many times more efficient than man in doing the same work. What it takes man hours to do, the laser can accomplish in seconds. The laborer's work is made much easier, time is saved, and high output quality is ensured. The only drawback is that such an engine costs more than 200,000 dollars on the international market.

Bulgaria will not have to dig into its pockets to pay this large amount, because the laser equipment plant is turning out the first models of this complex device in honor of the 30th Party Congress. Bulgaria has also set itself the goal of concentrating its attention on research making a definite contribution to increase in labor productivity, and for this purpose the assistance of specialists of the Institute of Optics is sought. Research on laser geodetic systems is one example, we are told by senior scientific associate Lyubomir Cheshankov. "Such systems quickly win admirers, and the number of prospective admirers is constantly growing. There is a good reason for this. When they are used, the productivity of construction site survey teams is increased by a factor of 3 to 5, and sometimes even 100," he states. "And the quality of construction and assembly work shoots up."

"Yields in agriculture can also be increased by means of Bulgarian lasers," we are told by the deputy director of the Institute of Optics, engineer Dimitur Georgiev. He then goes on to relate how a biological influence can be exerted on seeds to stimulate high seed germination capacity and make the seeds resistant to cold and damage. But he hastens to add that the primary problem facing the laser equipment plant for the time being is that of mastering the production of laser technology modules for industry.

To recapitulate, we can say that with the new technology we are now able to do things that until yesterday were beyond our powers. But we have another concern. It is good that we have the new technology, but are its users familiar enough with it? Is sufficient information about this technology reaching all those who need lasers? In addition, are scientific advances moving from the institute to the enterprise (in this case the laser equipment plant) fast enough to meet the efficiency requirements set by the resolutions of the 30th BKP Congress?

We are assured at the plant that the enterprise has sufficient capacity to produce the amount of laser equipment required to meet the needs of the Ministry of National Health. This is not the case, however, with the needs of industrial enterprises for such output. There is an acutely felt need for further modification of the plant. The buildings and warehouse facilities

are inadequate, and there is a lack of minor machinery and personnel capable of manufacturing the complex equipment. To put it bluntly, persistent and intense work will be needed, by everyone from the common laborer to the director, in order to provide modern devices for the Bulgarian machinebuilding industry.

And time marches on. Lasers are already knocking at the door in almost all areas of our lives. And if we want to keep up with the world lead in lasers (already there is unconcealed interest abroad in this new Bulgarian production), we must step up the pace of production, especially since the plant is the first production unit with a large-scale program for introducing laser equipment for the needs of the entire Bulgarian national economy.

With respect to the speed at which the scientific product moves to the plant, and speed is absolutely indispensable, due to the combined efforts of specialists of the Institute of Optics and plant personnel the results of research and development projects are moving relatively quickly to the plant to be applied in manufacture of laser articles. By qualifying the "quickly" with "relatively," we create the need for a little explanation. What we mean is that there is still work to be done in development of Bulgarian laser technology. We are told at the plant that the plant does not always receive good quality documentation promptly from the scientific institute, and this documentation is often better suited for pilot-scale manufacture than for mass production. This leads to loss of time.

An interesting suggestion has been made in connection with this critical time factor. It comes from scientific associates at the Institute of Optics. According to them, what is now needed is a stepped-up product introduction process, not just a routine process. Why is that only a trial run of a product makes its appearance after such prolonged vicissitudes? Why is it that so many months are unjustifiably wasted (it is whispered that the period is about a year)? Couldn't all the procedures followed through all the decision-making authorities (there are more than 10 of them) which ultimately give their weighty and decisive approval be completed in the process of step-by-step development of the experimental model? The two activities would be combined in one bold stroke.

Secondly--and again this is something heard at the optics combine--various interesting new technical solutions are generated in the development process. Some of them are even eligible for classification as inventions. But to be frank about it, the path of their advancement is still strewn with many bureaucratic difficulties. This is not surprising. Experience has shown that a number of significant inventions die precisely for this reason before they are fully born. What prevents them from always being protected? Is it that the Institute of Inventions and Rationalization has no special sector representatives at our leading institutes and combines throughout the country (including the Institute of Optics)? It must be pointed out again that such developments must be promoted. This promotion is essential to our national interests.

These are really sensible ideas. If they are applied in practice, effective Bulgarian laser technologies can reach the people more quickly. Why don't we apply the development described to us by senior scientific associate Georgi Kravaikov, department head at the Institute of Optics. It involves laser

heat treatment of cutting and measuring tools. It is even difficult to imagine that such heat treatment could increase the life of cutting tools by 3 to 30 times. On the national scale, this is truly a revolutionary result, and the authors of this project assure us that we can expect it to become a reality as early as this year.

6115

CSO: 2202/22

EAST EUROPE/MICROELECTRONICS

IMPORT RESTRICTIONS RELAXED; HUNGARIAN MICROELECTRONICS BOOSTED

Budapest NEPSZABADSAG in Hungarian 9 Jun 86 p 5

[Article by Tamas Szonyei: "Development of Our Computer Technology Culture; To Create Harmony Between Domestic Manufacture and Import"]

[Text] One frequently finds in the Miklos Hernadi Dictionary of Cliches the definition: "a fruitful subject for debate." Today, if there is a conversation in company, it is enough just to throw out the question, how far behind the world front rank is Hungary in electronics and in computer technology therein, and the mood becomes animated. Smaller and especially larger numbers are voiced, according to many the time can even be put at two decades. Of course one can hardly give a precise answer because of the many types of bases for comparison, but obviously everybody agrees that we do not dictate the tempo. It is good if we can adjust to it.

"I would estimate our backwardness at about 5 years overall," says Janos Kazsmer, deputy director general of Videoton. "I emphasize that this is an average; in some areas it is greater, elsewhere, for example in the case of line printers, it is documentably only 1-3 years."

Various types of printers make up a quarter of the computer technology production of Videoton; in this the largest proportion--50 percent--is represented by computer systems, the share of various terminals and displays is 17 percent while services and software together make up 8 percent. Seventy percent of what is listed here finds customers on the market of the socialist countries, 20 percent internally, while 10 percent is sold for convertible foreign exchange. This latter fact also defines what value of capitalist import the enterprise can carry out in order to have a zero balance in convertible trade.

"Whatever anyone says, a good quality Hungarian personal computer has a convertible import content exceeding 10 percent," says Janos Kazsmer, pointing to one of the sensitive points of manufacture. "Our other chief problem is series size; in order for us to be truly competitive on the international market we would have to manufacture printers, for example, in series of 20-30 thousand and not 3,000. This would require considerable investment and we would get the credits for it only if we had a contract for such a large

series. But we can get a commission like this only if we already have the capacity. So the vicious circle is closed."

No Longer Profile Patron

Videoton, the leading enterprise of the Hungarian computer technology industry, plays a significant role in the development of domestic computer technology culture. Of course it does not do so alone. At the beginning of the 1970's, acting from well conceived business interests, in order to help their sales in Hungary, a few large capitalist enterprises undertook to buy some of the products of the domestic computer technology industry then making its first efforts. This opened up new market possibilities for both sides. Among the capitalist world firms present in our country Siemens, for example, stood out in software cooperation, among other things, Honeywell delivered computer technology equipment for large state institutions, while IBM left its calling card with its equipment, its organizational experience, with a broad range of applications software and, last but not least, with services offered by its limited liability company in Hungary.

For many, many years--right up to the first of January this year--these firms and all the other foreign shippers and the domestic users could make business contact with one another only through a single foreign trade enterprise, Metrimpex.

"We might say," says Dr Mrs Sandor Fazekas, chief of the computer technology main department of Metrimpex, "that the enterprise was actually the institution, which realized the import conception of the Central Computer Technology Development Program."

Since the beginning of this year, in harmony with the decentralization of foreign trade rights, other enterprises also can deal with the import of computer technology. The ending of the so-called "profile patron" role in this way coincided in time with the expiration of the Central Computer Technology Development Program. Before we seek an answer to how this change may affect computer technology import and, in connection with this, the domestic spread of modern technology, we should become briefly acquainted with a few ideas of the central economic development program for the spread of the social-economic use of electronics. This is the program which succeeds to the SZKFP [Central Computer Technology Development Program] and formulates, from the viewpoint of state decisions, the strategic tasks, priorities and duties of state organs in the interest of seeing to it that the managing units should be able and want to use electronics.

The Program of Electronization

The theme demands special attention from both government organs and managing units, for one of the determining factors of accelerated scientific-technical progress is the development of microelectronics and if there are not crucial changes in this area here at home then our backwardness in comparison to the developed industrial countries, already significant, could increase further.

In this it is of fundamental significance that the enterprises be capable of receiving the new technology, be interested in it and be able to satisfy the demands for devices and systems. The interbranch part programs worked out within the framework of the program are intended to aid this. Examples are the part programs serving electronization training and education, development of the telecommunications network and computerization of state administration, for which the national economic plan provides central resources.

Hungary cannot set up for self-sufficiency in either research and development or manufacture and services, but still the domestic electronics industry must play an increasing role in satisfying user demands. This is justified on the one hand by the fact that the import coming from the socialist countries is not proving sufficient in itself in regard to variety, modernity or services and on the other hand by the fact that import coming from developed capitalist countries is limited by our foreign exchange payment possibilities and delivery limitations. The Hungarian electronics industry will increase in the years ahead the manufacture of small and minicomputers, professional personal computers, local computer networks, computerized design and office automation systems and the computer technology peripherals fitting into smaller systems in regard to price and services, among other things. We must import the larger capacity computers, medium capacity peripherals, electronic parts, robots and complex automatic systems primarily from socialist countries. We must continue to obtain from the developed capitalist countries certain electronic technology equipment, intelligent measuring instruments and computer technology systems, peripherals and electronic parts, designing and software development systems, etc. which cannot be provided domestically or from socialist import, among other things.

So in addition to creating the domestic conditions--the already mentioned receptivity and interest--the electronization program can be carried out only within the framework of intensive international cooperation, and the determining elements of this, in addition to CEMA level agreements and bilateral government agreements, are mutually advantageous contacts with capitalist countries or enterprises.

Arguments and Counterarguments

A consultative committee of the Electronization Economic Development Committee is trying to move the computer technology investments of the enterprises--including import--in a direction corresponding to what is contained in the program outlined above. This committee develops its opinions primarily on the basis of professional, applications technology positions. It studies from what source a given task can be solved best, keeping in view, for example, a requirement for the uniformity of the domestic computer inventory lest freeing the import rights should lead to unjustified acquisitions.

"When formulating the new regulations affecting foreign trade rights the Ministry of Foreign Trade was guided by the principle that by making the foreign trade organization more flexible we would bring the producers closer to the market," explains department chief Dr Pal Simak. "Profile restrictions ended for virtually every product group. The Ministry of Foreign Trade felt that computer technology should not be an exception. The viewpoints of the

program must be realized not when signing a contract but rather when starting the investments."

The few months which have passed since the beginning of the year are obviously too short a time for an evaluation of the effect of the provisions but it can be established already that something has changed. Arguments and counterarguments are being formulated. According to some the ending of profile assignments can lead to a result just the opposite of that desired; the country will not get more money for imports this way, what it does get will be scattered, and then there goes the favorable position of the wholesale purchaser. Others feel that the users will give import commissions to that enterprise which can offer the most favorable conditions.

This debate will be decided by the practice of the months and years ahead--hopefully not to the benefit of those pessimists according to whom the import struggle will force up the import prices unhealthily because the always impatient users will accept the first bid instead of permitting lengthy competition in order to get the long awaited technology as soon as possible--even if more expensively.

Is The Market All Astir?

The change will (can) affect the former "profile patron" Metrimpex directly.

"We trust," argues Dr Mrs Sandor Fazekas, "that the market and professional information which we have accumulated in the past 20 years will convince the users that it will continue to be worth while to import through us, because we have always striven to get the best possible conditions. Nor do we rule out a broadening of our own profile, for maintaining our trade may require this, but if possible we will remain with goods close to the previous ones."

Elektromodul is one of those firms which can bring a stir into the not entirely tranquil waters of computer technology import. Director general Gabor Iklodi emphasizes that although they will continue to maintain their basic profile--trade in parts, fittings and subassemblies--they will undertake other things if the situation arises. This year, for example, they bought 100 IBM compatible Multitech brand computer sets in Taiwan and finished them here at home.

"The news of this shipment had hardly gone out when customers flocked in so each of them could purchase only a limited number--at most three--of these cheap and reliable machines. Most of them were bought by educational and research institutions. In the future, Elektromodul also intends to continue the import of this computer," says the director general.

And so we have reached one of the domestic neuralgic points of computer technology, the personal computers, but a discussion of the import of these--including the private import which is on a significant scale and which prompts extreme position statements--exceeds the frameworks of this article. Just a fresh datum about the development of supply: The Skala Coop, which more than 2 years ago was the first of the enterprises belonging to the socialist sector to import personal computers within the framework of a special goods exchange

deal, has signed a contract with the English Apricot firm to buy computers which could satisfy primarily the professional needs of agricultural, industrial, consumer and savings cooperatives. Together with this--according to information from Miklos Torok, mixed industrial goods director--they will form a new organization to deal exclusively with computer and office machine technology. And to complete the circle the large cooperative enterprise has given a commission to Metrimpex to import the Apricot machines--since the independent foreign trade rights are realized only within certain limits--but Videoton will also have a part in the undertaking because it will pay for this import by delivering computer technology equipment--monitors and power units.

Such and similar acquisitions could help the enterprises raise the level of their production culture, increase their performance and export capability, moderate their production costs and, speaking in general, accelerate technical progress. Hopefully the importing enterprises are making their business decisions keeping in mind not only their own interests but also the interests of the people's economy. If possible it must be avoided that, for example, the articles figuring in Hungarian export in compensation deals could also be sold for ready cash. It would not be proper if the import of finished products completely drove out the import of parts and subassemblies thus reducing in the given case the more economical domestic assembly activity. Finally, naturally--and this is the affair of economic guidance and not of the enterprises--care must be taken that the import not increase to the detriment of domestic manufacture, rather it should encourage competition.

8984

CSO: 2502/63

EAST EUROPE/MICROELECTRONICS

HUNGARIAN 'PEAK' ACHIEVEMENTS IN INTEGRATED CIRCUIT PRODUCTION

Budapest NEPSZABADSAG in Hungarian 26 Jun 86 p 5

[Article by Katalin Magos: "From Ujpest to Silicon Valley?"]

[Text] If there is talk of microelectronics, or of the manufacture of parts used in the modern instrument and computer technology industry, in informatics, we always mention our years of backwardness, our "irretrievable" disadvantage. The chronicles do not describe the successes--although we have achieved them in partial phases. But the equipment, and its constantly further developed versions, of the researchers at the Microelectronics Enterprise--about which we hear often today in connection with the fire, but life, as our example proves, goes on--used in the metaling (wiring) of the silicon wafers serving as the basis for parts and patented in a number of countries--including the United States--has been constantly ahead of the most developed industrial needs for several years.

The critical phase of semiconductor manufacture is when layers of aluminum or an alloy of it must be put on silicon wafers from which, with a photolithographic procedure, one can develop the connections, the "wiring", of the planned microelectronic element. And as the size of the microelectronic elements decreases one must develop further the methods and tools of the operation mentioned. An invention of Hungarian researchers--electrical engineer Gabor Kertesz and physicist Dr Gyorgy Vago--of several years ago, or the further developed versions of it, represents the peak in the armory of metaling technology.

A Leading Research Site

The success can be attributed to long years of deliberate research and development work and to a few accidental events, thus the story emerged from an interview with Dr Gyorgy Vago. The physicist has been dealing with the development of technological equipment for semiconductor metaling since 1968. Prior to this he worked out a method for electron beam welding, but since there was no considerable demand for this it was lucky for him that at that time that the Communications Engineering Industry Research Institute (HIKI) (the predecessor of the MEV [Microelectronics Enterprise]) began manufacture of such devices (known in the trade as MOS). It was not possible to metal these with the traditional vaporization. The essence of the traditional

technology is that the aluminum is vaporized from a heated tungsten wire or vessel. But the aluminum loosens the sodium added to the tungsten at the time of manufacture and brings it with it to the layer and so the MOS device is ruined. To avoid this they developed a special type of electron beam vaporization, the gun method. It soon turned out that the first version was not suitable for semiconductors, but after a careful study of the experience acquired in the meantime and of the professional literature they succeeded in making the first device which was of equal value to the best equipment of the time. Using this in the institute they could measure the possibilities and limitations of it. Thanks to the series manufacture begun in the wake of the development the institute soon became a leading research site of the CEMA countries. It cooperates with a vacuum technology factory in the GDR; there they build the electron beam vaporization sources of the HIKI-MEV into their vacuum technology equipment.

The Price of Miniaturization

If the dimensions of semiconductors had not decreased further throughout the world this would have been the end of the development and of the story. But miniaturization assigned a new task; pure aluminum could no longer be used for wiring, because at the high temperature of procedures following metaling the aluminum and the silicon have an effect on each other, diffuse into one another, and the aluminum which gets into the silicon short circuits the circuit elements. In addition the increasing circuit density accompanying the reduction in size causes faults in the aluminum wires. Both problems can be reduced or eliminated if the aluminum is alloyed with silicon or copper, but there is a great price for this solution--the procedure becomes very complicated, because simultaneous with the electron beam vaporization three different materials have to be carried simultaneously in definite ratios, which is a virtually impossible task.

This situation produced a turning point; they returned to cathode atomization in place of vaporization. This procedure had a significant role in vacuum metaling for a long time, but it could not be used in semiconductor manufacture--for a number of reasons. In 1939, however, Penning had patented--although for another purpose--a principle for vacuum measurement which simultaneously uses an electric and a magnetic field in a gas discharge.

The first atomization source using the Penning principle was patented in the United States in 1973. One year later--first among the socialist countries--they began the development of equipment working with this principle in the GDR. The MEV (formerly the HIKI) began research on the theme with great intensity in 1978; at that time the Penning atomization sources were already on the embargo list and Hungarian institutes--among others the Central Physics Research Institute--had a burning need for them. They succeeded in creating a device of equal value to the products placed under the embargo. They soon recognized that the soul of the device was the development of the magnetic field. In the interest of a solution experts in vacuum metaling and magnetic fields together worked out the conditions for the development of an ideal magnetic field. The atomization source prepared on the basis of this passed the tests well; it's originality is proven by the fact that they received

patent protection for it not only in Hungary but also in the FRG, the USA and Switzerland.

Better Than What Was Embargoed

1980 is again a famous date in our story. An American businessman arrived at the HIKI to make a bid to sell to the institute a machine line for the manufacture of liquid crystal displays. During the discussions he said with sorrow that he could not deliver the most critical element, the atomizer, because of the embargo. And it is not needed, the people at the institute replied, because they had something better than the equipment on the embargo list. After the incredible sounding announcement the American partner took a look at the Hungarian equipment and soon announced that it was so good that he could sell it in the USA too. He only asked for one piece of equipment and an expert for market research. In 1982 another firm took over the business in the United States; since then it has sold the product and assigned the developmental tasks. Thus far the Hungarian researchers have always been able to meet the needs level of the peak technology; again and again they have developed equipment which did not exist on the American market and for which there is as yet no need, not only in Hungary but hardly in Europe either. Only one example--the size of the silicon wafers is constantly increasing; in our country they are three inches, in Western Europe they are five inches. But in the USA a Hungarian developed atomization source suitable for coating a six inch wafer has been in operation for 2 years already.

And while hundreds of the devices developed here are being sold each year in America the research staff of the MEV is already struggling with a new task; although industry nowhere uses eight inch wafers yet they are already working on the development of a source which will be suitable for this.

But the equipment and the associated technology can be used not only in semiconductor manufacture. For example, they have prepared a laboratory model of the source with which the entire surface of computer disks can be evenly coated with the necessary layer.

Technological development is going on parallel with source development. One might say that here at home they have not yet formulated the majority of the tasks which the members of the atomizer source family, bearing the trade mark Pentron, are capable of performing.

The Pentron can be used in many areas still; the examples listed are technologies already realized elsewhere. Applications range from preparing aluminum coatings for papers used in packaging preserved milk to putting the edge coatings on machine industry tools. (For example, one can achieve a three to ten fold or even 25 fold increase in life expectancy with titanium nitride.) The source can also be used to apply heat reflecting layers to glass or heating filaments to automobile windshields.

But the development of such and similar technologies and equipment pays off for the enterprise only above a certain number of units, so it is to be feared that many, many good ideas remain only ideas until, because of a visiting foreign businessman or perhaps an embargo, a domestic enterprise sees possibilities in it.

EAST EUROPE/SCIENTIFIC AND INDUSTRIAL POLICY

HUNGARIAN SCIENCE ACADEMY RESPONSIBLE FOR RESEARCH DIRECTION

Budapest MAGYAR NEMZET in Hungarian 10 May 86 p 1

[Text] The 1986, or 146th, General Assembly of the Hungarian Academy of Sciences concluded its work Friday in the Congress Hall of the Academy. At the closing session Ivan T. Berend, Academy president, summarized, in his remarks which began the discussion, the results that were achieved in the past period. He said that despite the increasingly difficult circumstances in recent years the Academy succeeded in the past year in augmenting scientific knowledge. Among the internationally highly valued results accorded worldwide recognition, he emphasized the collaboration of the 200-member collective at the Budapest Technical University in the Vega space program, which was organized to observe Halley's comet. The President also paid tribute to the work of the Plant Biology Institute of the Szeged Biological Center. He stated that the researchers there were the first to describe by means of modern cell genetics the phenomenon of gene exchange between chloroplasts--the green plastids--of two plant species. He also judged the Chinoin laboratory's research in cyclodextrin as important.

The experts employed at the Academy institutes contributed greatly to the realization of our energy policy goals, said Ivan T. Berend. At Foldes and the northern part of Szeghalom, geophysicists have discovered net natural gas deposits whose exploitation has already been undertaken. Engineers and physicists at the KFKI [Central Physics Research Institute] have worked out procedures that will result in 2 billion forints' worth of savings at the Paks Nuclear Power Plant.

Special attention was given in the President's report to the role and responsibility of the Academy in executing national research tasks. Expansion of the Academy's national scientific management role was inaugurated a month ago after lengthy preparatory work. About two-thirds of the country's basic research activity will be conducted at Academy institutes, and as of the present the Academy of Sciences is responsible for the direction of all basic research in Hungary. In the social sciences, it will direct all national research projects, besides those at social and party institutes.

Regarding the importance of OTKA (National Scientific Research Fund) he said that collective scientific opinion will properly weigh the degree to which it will be possible to realize selectivity in observing the

principle of quality and how we can eliminate the equality we have become accustomed to in institutional support, and the growing hierarchical order in distribution. Speaking of the coming period, he emphasized that we have to strive harder than ever before to solve the difficult tasks that are facing us. It depends on us whether we shall be able to continue the trend of closing the gap or whether we shall allow ourselves to lag behind and drop to the rear.

In his analysis of the Academy's international relations he pointed out the importance of close collaboration with Soviet science, and he also stated that research groups will be created to collaborate more consciously in every area within the framework of CEMA scientific-technical cooperation to the end of the century.

Following this, Istvan Lang, secretary general of the Academy, spoke. He recalled that at the Academy's General Assembly last year he urged the modernization of the management system at research institutes. The Academy leadership worked out a proposal for the financing and further development of an incentive system for scientific research--essentially the national budget research institutes. The Science Policy Committee approved this proposal in 1985, and called for the inauguration of the new system in 1986.

Continuing, the Secretary General of the Academy spoke of the competitive system and of greater support for basic research. The Science Policy Committee established OTKA with a planned goal of almost 4 billion forints for the Seventh 5-Year Plan period to cover the acquisition of essential equipment and furnishings. Grants may be obtained from the Fund under a competitive system of support, in an open and democratic manner, and with the application of strict criteria. OTKA does not belong to the Academy but to all of Hungarian scientific research.

Finally, the Secretary General reviewed special research tasks, noting that the Academy participates in the preparation of planning for the people's economy. The government has made use of Academy analyses relating to the organizational system of our economy and the further development of the reform of the economic mechanism. Until now, research projects serving to develop a unified socio-political concept established the bases for long-term socio-political decisions. We have also created comprehensive, synthesizing projects to develop our historical and cultural values.

Refresher Training and the Scientific-Technical Priority of Industry

Bela Kopeczi, academician and minister of culture and education, spoke to the General Assembly. The ministry wants to make higher education more open, he said. It is important to seek for new forms of cooperation with the Academy institutes. It is unconditionally necessary that in teaching, primarily in postgraduate training, and in research university departments and scientific institutes should rely more on each other. In order to extend cooperation, the Ministry of Culture and Education will study the possibilities of association and even of integration. He went on to say that we must strive to develop an appropriate system of continuing education

in higher education for the natural and social sciences. In speaking of higher education and research recruitment, he stated that nowadays selection is not adequate to the purpose, the postgraduate institution in its present form is not sufficiently effective, for it does not avail itself adequately of the possibilities in foreign or continuing training. He proposed that the Committee on Scientific Qualification, the Academy, the Ministry of Culture and Education, and other ministries should join to work out a proposal to determine the way to take the necessary step forward. Pal Tetenyi, academician and chairman of the National Technical Development Committee, presented information on the programs of the National Medium-Term Research Development Plan for the Seventh 5-Year Plan period. He said that bodies and organizations for developing the programs have been set up everywhere. Most of them have also prepared detailed subject plans for the years 1986 and 1987. The directors of the program wish to use competitive methods to a greater degree for the establishment of broad-scale development tasks and for the selection of enterprises offering the best solution. It is characteristic of the research-development plan that energies are being concentrated to a greater degree than under the Sixth 5-Year Plan. There are now 10 programs instead of 16, and the planned outlays have been substantially increased. The programs are also well suited to the main guidelines set forth in the complex program of the CEMA countries extending to the year 2000.

Laszlo Kapolyi, academician and minister of industry, asked leave to speak at the 2-day discussion of the General Assembly. He emphasized that science is an extremely valuable and indispensable base of our industry and unlike in the past, we must develop a continuous and systematic cooperation with it based on our mutual interests. He recommended that an interdisciplinary presidential committee be established in the Academy to follow continuously the problems of basic importance to industry. He also proposed that industry together with the divisions of the Academy should establish joint forums which would make it possible to arrive at strong scientific-technical conceptualizations for industry along with industrial leaders interested in research and technical development.

Among the speakers some said that there is need for a new, modern dictionary reflecting the present state of development in science. Preparatory measures were taken to this end in the 1970's. The speakers proposed that the Academy, using its own means, should promote the preparation of the dictionary. Some went on to say that in the past quarter century material support for medical science has declined. They emphasized that the level of equipment in clinics is not adequate, and that the funds for acquiring foreign journals are too small. They said that this makes it difficult for Hungarian medical science to keep abreast of the most significant results that are achieved in the world. The 146th General Assembly of the Hungarian Academy of Sciences concluded with the passing of a resolution.

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