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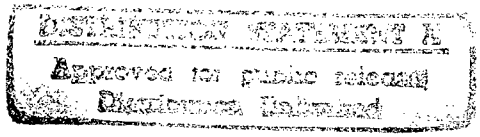

Science & Technology
Europe

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ADVANCED MATERIALS

Italy: Research Institutes Set Up Advanced Materials Center

92MI0445 Milan ITALIA OGGI in Italian 31 Mar 92 p 14

[Text] The new research center for the development of advanced materials for the chemicals sector and technologies for the transformation and design of plastics, will be constructed in Portici near Naples. The investment envisages an extraordinary program for the South, under support and innovation measure No. 2, and amounts to 46.5 billion lire. Once fully operational, the center will employ a staff of 90 that will include 35 researchers. In the next few days, the agency for the development of the South will draw up the agreement with ENEA [Agency for New Technologies, Energy, and the Environment], which is in charge of developing the project through the Campec consortium, comprising ENEA, CNR [National Research Council], the University of Naples, the Donegani Institute, and the municipality of Portici. The new center will be located in the Granatello area, where some research institutes are already situated, such as the ENEA's photovoltaics institute and the CRIAI research institute. In addition to basic research, activities will also include applied research with a special emphasis on small and medium-sized enterprises, which Compec will assist in choosing technologies, optimizing production processes, and transferring know-how. The consortium will also conduct quality certification on products and train technical personnel. Of the 46.5 billion lire allocated by the extraordinary program for the South, 23 billion lire will be spent over three years in constructing the laboratories. Why the decision to fund the project, which was already included in the first annual implementation plan? The goal of the ministry is to direct the national plastics industry toward technological development and the supply of services.

AEROSPACE

Dutch Institute Produces Star Sensors in ESA Project

92BR0255 Rijswijk POLYTECHNISCH WEEKBLAD in Dutch 5 Mar 92 p 3

[Article by Gerard van Nifterik: "TNO Makes Star Sensors For Scientific Satellites"]

[Text] TNO is to make five star sensors for the European Space Agency (ESA). These will be navigation instruments, specially produced for the satellites in the so-called Cluster mission, a project being planned for 1995.

The Division of Technical Physics (TPD) of the Netherlands Organization for Applied Scientific Research (TNO) has already earned itself a name in the field of star sensors. According to project leader Eng. G.C. de Valk, TPD is without doubt the market leader within Europe. Even stronger proof is the recent order from ESA, which is a direct consequence of successful earlier activities. The legendary Giotto probe, for instance, which observed Halley's comet from close by a few years ago, navigated using TPD sensors. As can be deduced from Giotto's success, these sensors did their work outstandingly and those who commissioned them have not forgotten this.

The Cluster program—the project for which the sensors are intended—is a purely scientific mission which will be mapping the earth's electromagnetic field. More understanding is necessary concerning interaction between the magnetic field and solar wind (a constant rain of charged particles, originated from the sun). It is possible that such interactions could be affecting the earth's climate.

Navigation

Four satellites will be taking part in the project and will be launched simultaneously (on one of the first flights to be made by the new Ariane 5 rocket). The four will fly relatively short distances apart (varying from a few hundred to several thousand kilometers) by which method it will be possible to make very accurate measurements. Excellent navigation is crucial, and every satellite is therefore equipped with a star sensor (TPD is supplying five; four will go into space, the fifth will be a spare). The sensor studies a section of the stars in the sky and sends the information back to earth. The computer in the ground station can then calculate the satellite's position from the star pattern.

The navigation system makes use of the fact that the probe turns on its axis 15 times a minute. By allowing the sensor to look obliquely overhead and to turn normally with the satellite, it "sees" a broad band of the sky. A band breadth of 9.2 degrees provides sufficient information to pin-point its position. The sensor is equipped with a lens system consisting of two groups of lenses which transfer a picture of the stars onto a photo cell. This supplies information not only on the stars' brilliance but also on their position. The latter information is obtained as a result of the shape of the detector. The V-shaped photo cell enables the sensor to pick up two images of a star (the satellite's rotative motion makes the picture as it were slide across the detector). A star therefore provides two pulses. If a star appears overhead in the picture (in the upper part of the V, that is) then the time between those two pulses is logically longer than when a star is pictured low down. From this information the angle between the axis of the satellite and the star can be calculated.

In addition the sensor is equipped with a carbon-fiber-reinforced epoxy hood provided by the Plastics and Rubber Institute (also a part of TNO). This hood contains a sort of wide diaphragm to prevent reflection of sunlight. In addition TPD is supplying the electronics to prepare the signal for relaying to the ground station.

Range of Expertise

According to De Valk, the success of the sensors is due to the diversity of knowledge which is available at the institute, which possesses a range of multidisciplinary expertise which is seldom to be found. He finds it a privileged position, the more so because there are associate TNO institutes at only a stone's throw, not to mention its other neighbor, the Technical University of Delft. There is knowledge available, therefore, and TPD takes full advantage of it. The institute has risen to become one of the leading Dutch space concerns.

In addition, in parallel with the Cluster project, the Americans are sending a probe to the sun (the Soho project), specifically to obtain information on solar activity. The intention is to combine the information received from Soho with that from Cluster. A pleasing touch is that Soho is not equipped with a star sensor, but with sun sensors. From TPD, of course.

British Airways To Replace Jumbo-Jets By 1998

92MI0396 Bonn DIE WELT in German
25 Mar 92 p 24

[Article by Siegfried Helm: "A Giant Leap Into the Next Millennium"]

[Excerpt] [Passage omitted] The jumbo jet will be followed by the mammoth jet. British Airways [BA] has identified the requirements to be met by the generation to follow the jumbo jet and has given a 10-strong team of experts 18 months to produce detailed plans for the new wide-bodied jet for presentation to the aviation industry. Rod Muddle, BA planning chief, has announced in London that BA had already made contact with Boeing in Seattle, McDonnell Douglas in St. Louis, and the Airbus consortium. Mammoth jets are scheduled to go into service in 1998. "Since the development of the 747, no fundamental innovations have been introduced," said Muddle. BA wants to make a giant leap into the next century of aircraft engineering.

The 377-seat Boeing-747 will be replaced by a wide-bodied aircraft with between 600 and 800 seats that will still not be too large for international air traffic turntables. It should be quieter than its predecessor, fly higher and for 14 hours non-stop, and also consume less fuel. The mammoth plane will bring a cost saving of some 20 percent. Passengers' fears about backache, circulation complaints, or legs going to sleep on flights to Singapore or Los Angeles will "take flight," for in the wide-bodied aircraft of the future they can exercise in the fitness studio. A completely new feeling of space is being created in the horizontal fuselage tube by using a vertical lay-out. Three floors are created in the fuselage by incorporating two intermediate decks, an idea inspired by the jumbo ferries built in Bremerhaven for P & O's English Channel traffic. The windowless upper deck will be fitted with (even) more comfortable reclining seats, indispensable for takeoff and landing. The luggage compartments will be recessed, there will be cloakrooms, and space for hand luggage in the special seats, which will also have a retractable screen for video films. The middle deck will also be designed for comfort with a self-service restaurant where the passengers will be able to select the dishes to make up their meals. Stewardesses on flights to Singapore would be overworked if they had to bring the 1,600 meals to the passengers in their seats in the cabins. Thirsty passengers will be able to help themselves from the drink machine. There will be a lounge with armchairs and sofas to stretch out on. It is also hoped that space may be made for sleeping cabins.

Whereas meals now reach the passenger by elevator, tomorrow the passenger will take the elevator to the lower floor: To the fitness center or the business center with its offices equipped with telephones and computers, where the boss can make use of the journey with his secretary, instead of killing time with small talk. The business center will communicate with international "listening posts" by satellite. Films will be shown on the giant screen on the lower deck.

But the mammoth jet is not only designed for the greater comfort of the passengers. The increase in air traffic is forcing airlines to rethink. Airspace congestion, with increasingly frequent stacking over the major approach corridors, and the mounting pressure on overloaded airports to expand are only two of the many problems. The new wide-bodied jet kills 600 to 800 "birds with one stone."

For take-off, flight, and landing, mammoth jets must have a considerably larger wingspan than present-day jumbo jets. However, to avoid having to rebuild landing bays at international airports, they will have telescopically extending wing surfaces. In the retracted state the wingspan will not exceed that of a Boeing 747-400. The mammoth jet will probably also have twin tail fins.

ESA Awards ERS-2 Contract

92WS0398C Paris AFP SCIENCES in French
27 Feb 92 p 11

[Article: "ESA Orders Second ERS Satellite"]

[Text] Friedrichshafen—On 21 February, the ESA [European Space Agency] ordered a second earth observation satellite, ERS-2, from Dornier Gmbh (Deutsche Aerospace, Daimler-Benz Group), according to a press release by Dornier's management.

Under the terms of the contract, valued at 450 million German marks (1.530 billion francs), Dornier, as prime contractor for the construction of this satellite, will head an international consortium consisting of enterprises of 14 countries. Dornier had previously coordinated the construction of ERS-1, which was launched on 16 July 1991 by an Ariane rocket. ERS-2 is to replace ERS-1 in 1994.

ERS-1, one of the most modern remote-sensing satellites, is designed primarily to observe the planet's environment. Like it, the ERS-2 will be equipped with a radar that, unlike the optical systems carried by most other observation satellites, is capable of penetrating the clouds regardless of meteorological conditions. This feature, in particular, enables better studies of the oceans and the tropics.

ERS-2 will carry a new instrument aboard, the GOME [Global Ozone Monitoring Equipment], for the specific purpose of measuring the quantity and distribution of the ozone in the upper layers of the atmosphere. GOME will be able to measure precisely the proportion of the sun's rays reflected by the ozone layer, and that reflected by the surface of the earth, and thus provide a measure of the damage being caused by CFCs [chlorofluorocarbons] to the ozone layer.

Dassault Aviation Using New Manufacturing Process

92WS0535C Paris L'USINE NOUVELLE in French 23 Apr 92 p 70

[Article by Olivier Lauvige: "The SPF-DB Is Inflated"; first paragraph is L'USINE NOUVELLE introduction]

[Text] By "inflating" a stack of several metal sheets inside a forming mold, the French aircraft maker produces a large, complex "honeycomb" structure in a single operation. It also reduces its production cycle by 40 percent.

SPF-DB technology, which stands for Super Plastic Forming and Diffusion Bonding, is just as hard to do as it is to say. Yet Dassault Aviation's Poitiers plant uses it to mass produce some of its aircraft components.

The technique consists of producing a large, complex "honeycomb" structure from a stack of titanium sheets in a single press operation! Titanium has the same mechanical strength as stainless steel, but with half its density. It has two special metallurgical features: It can be deformed up to 1,000 percent and it is easily diffusion-bonded (the adhesion of two pieces through interpenetration of their metals' atoms). Both operations require high pressures and temperatures. Since those constraints are identical (900°C under 20 bars), they can be implemented simultaneously. Thus, by "inflating" a stack of pre-prepared and carefully arranged sheets inside a mold, manufacturers can produce a monolithic structure that is partitioned by a row of stiffeners perpendicular to its surface.

Work to develop SPF-DB began in the mid-70s at Dassault Aviation's Saint-Cloud research center. It continued until 1985, when the technology was industrialized to manufacture major components of the Mirage 2000. By 1987, the first slat prototype (a leading-edge component) was mounted on the Mirage to undergo various flight tests. The new-generation piece part weighs 10 percent less than its aluminum predecessor. It requires fewer components. Whereas a traditional slat contained 75 detail parts and 750 rivets or fasteners, now 25 parts and 160 fasteners will do the job. "And we have not yet optimized the slat's design," adds Jean Lafond, the director of the Poitiers facility. Finally, despite a forming time of 10 hours, SPF-DB technology reduces production cycles 40 percent by eliminating all the subcontracting phases.

The technique does have some drawbacks, however. It is extremely complex to execute (a pressure difference of a few tenths of a gram between the parts' honeycomb cells can change the position of the backups and the effectiveness of the bonds). Consequently, the reject rate is still 15 to 20 percent. Moreover, the parts' monolithic structure requires an industrial X-ray television monitor that is controlled by a robot arm with eight axes. "These inspections are necessary, for SPF-DB is still a new manufacturing process that has not been totally mastered," explains Jean Lafond. "When it is, the number of inspection steps will drop."

SPF-DB technology was developed to meet the stiff requirements of military aviation. It may be simplified for transfer to other industries (chemical, civil aviation, or medical), since all fields require the use of titanium. But titanium is not the only metal that has superplastic-forming and diffusion-bonding properties. Aluminum is also a super plastic, and the specialists at the Nantes School of Mechanics have successfully diffusion-bonded it. This first is expected to open up fabulous markets for SPF-DB technology.

Super Plastics to the Rescue of Difficult Forming Operations

Discovered in the late 1960s, super plasticity is used especially to form difficult parts. It is based on the capacity of titanium metal grains to slide in relation to one other at about 900 degrees C. At that temperature, titanium remains solid, but can be shaped as easily as a sheet of plastic. Titanium sheets are placed in a non-cutting tool in which a neutral gas (argon) is pressure-injected. The parts form very slowly (eight-hour cycles) and wed to perfection all kinds of complicated forms that are nearly impossible to obtain using classic non-cutting techniques. The first super-plastic-forming applications for new alloys, in particular aluminum-lithium, will be wingtip fins on a civil plane.

AUTOMOTIVE INDUSTRY

Recyclable Aluminum Developed for Automotive Applications

92WS0488C Duesseldorf VDI NACHRICHTEN in German 27 Mar 92 p S14

[Article by Dr. Rolf Deipenwisch, managing board member, Duesseldorf Aluminum Center: "A Recycling-Friendly Light Metal Takes Off; Aluminum Industry Growing in New Markets; Companies Demonstrating

the Link-Up of Economy and Ecology in Hannover With High-Tech Transportation Products"; first paragraph is an introduction]

[Text] Duesseldorf, 27 Mar 92 (VDI-N)—The aluminum industry is making its joint appearance again in 1992 too from 1-8 April in hall No. 28 at the Hannover Trade Fair. It expects for 1992 a slight increase in the present annual consumption of over two billion tons of the light metal. The main reason for the increase is the introduction of innovative technologies in automobile and rail car manufacturing, as described below by Dr. Rolf Deipenwisch of the managing board of the Duesseldorf Aluminum Center.

Around 400,000 tons of the versatile material aluminum are expected to be required this year just in the transportation field. The automobile and rail car branches will maintain the major part of Germany's aluminum consumption with over 30 percent. A growing trend: For, instead of the approximately five percent up to now, up to one fifth of the automobile is to consist of the lightweight and easy-to-machine metal as early as in the next several years.

Automobile manufacturers' interest in aluminum has various reasons. To begin with, its machining means a clear reduction in weight vis-a-vis conventional materials, and this without loss of the vehicle's stability. Lower weight results in lower fuel consumption and with that in fewer pollutants given off into the environment through exhaust gases.

Aluminum is influencing automobile design in several respects. The many years of efforts to include aluminum in the area of automobile bodies also are now facing a breakthrough. Just recently the construction of the world's first production facility for aluminum tubular frames was begun in Soest. The German automobile manufacturer Audi will be the first customer.

Aluminum castings for chassis, engines and transmissions have stood the test for a long time in automobile manufacturing. Entire engine blocks made of aluminum, reserved until a few years ago for 12-cylinder models of the luxury class, since then have made an appearance in cars in the medium range also. Improvements in die casting technology are today making possible the construction of lighter-weight and more compact engines. Just the weight saving here is around 20 and 30 percent.

However, it is not just engines that are profiting from the new trend. Examples of additional innovative parts made from aluminum are pistons, cases for oil pumps and antilocking systems, axle tubes for shock absorbers, radiators, wheel rims, and bearing blocks for pedals or chassis connecting rods. The lightweight construction technology for passenger cars is of course making its appearance in commercial vehicles. Dashpots and auxiliary heating or heat exchanger parts for diesel fuel, that are being manufactured in part in quite complicated aluminum casting processes, are examples here.

The average share of aluminum in a car in the medium range today is around 50 kg. This figure is to increase markedly in as early as a few years, and this will have an effect especially on recycling too. In addition, aluminum can be recovered almost completely. With this its increasing share will ensure over the long term the cost-effective recycling of old automobiles.

A comparable trend is to be noted in rail car manufacturing. Manufacturing from aluminum scored a trailblazing success in the ICE [Intercity Express], the showpiece of the German Federal Railways. Just this project makes the merits of this type of construction obvious. Energy costs can be economized on by the car's low weight, and the rail system is spared—lightweight construction is indispensable in light of the substantially faster traveling speeds. In addition, the rustproof metal results in longer life for the car, and, into the bargain, the integrated method of construction with extruded large sections also lowers manufacturing costs.

Around half of all coaches planned or under construction in Europe in railway construction are already today getting a car body made of aluminum. The reason for this is that overall economic aspects are playing an increasing role in the procurement of durable capital goods. That is to say, based on the first long-time experience now available with aluminum car bodies, it appears that the requirements for energy economizing, resistance to corrosion, simple remedying of accident damage, as well as profitable and environmentally acceptable recycling of the aluminum used, are being completely fulfilled.

The trend for the use of aluminum in other branches is also increasing. The construction industry is in first place with annual consumption of more than approximately 200,000 tons, followed by machine-building with over 110,000 tons a year and the electrical equipment industry with around 60,000 tons a year. Therefore, the aluminum industry has reason enough to look optimistically into the future.

BIOTECHNOLOGY

Germany: Max Planck Society Approves Marine Microbiology Institute

92MI0438 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 1 Apr 92 p 2

[Text] At its last meeting in mid-March, the Senate of the Max Planck Society approved the charter of the Bremen-based Max Planck Institute of Marine Microbiology. The decision to establish this institute—initially designated the "MPI of Microbiological Ecology"—was taken by the Senate in mid-1990. The future directors of the institute, Prof. Bo Barker Jorgensen from Aarhus in Denmark and Prof. Friedrich Widdel from Munich, who also suggested the change of name, have accepted the chairs offered to them as of 1 July 1992 and 1 April 1992, respectively and have started on the preparations for

setting up the institute. Its work is expected to include research into natural microbial colonies in mud flats and in shore sediments and studies of pure bacteria cultures isolated from natural marine habitats.

COMPUTERS

Experts Debate Value of Artificial Intelligence Research

Researcher Gives Positive View

92WS0460A Duesseldorf HANDELSBLATT in German 3-4 Apr 92 p K 3

[Article by Dr. Gerhard Barth, professor, German Research Center for Artificial Intelligence, under the rubric "Career; Controversial; Artificial Intelligence": "Two College Teachers Express Different Opinions About the Sense and Use of Research in the Field of Artificial Intelligence. Scientific Dream or Technical Nightmare?"; first paragraph is an introduction]

[Text] 3 Apr 92 (Karriere [Career])—The German Research Center for Artificial Intelligence (DFKI) is domiciled in Kaiserslautern. Its scientific-technical director, Professor Gerhard Barth, is pleading for unbiased handling of his favorite subject of research.

Some consider artificial intelligence baloney, others an important advance of computer technology. I belong to the second group.

I find the name chosen for the field very misleading. It creates in many people the erroneous idea that artificial intelligence research aims at concepts, methods and techniques for the perfect modeling of all of man's intellectual faculties. On the contrary, it is concerned with solving, by means of the computer problems in which humans are quite definitely directed, by their knowledge.

There are many examples of technical systems that can solve the same problems as natural creatures can without precisely using their methods. Airplanes and ships, for example, fall under this heading. They do not move along by flapping wings or fins, and no one would seriously arrive at the idea of referring to them as artificial birds or fish. Neither should so-called AI systems be exact likenesses of humans.

Automatic knowledge information processing is a much more appropriate concept for the field. Nowadays computers can already be used for much more than fixed preprogrammed operations on data. They are able to store formally represented knowledge and use it for inference purposes. This for one thing raises the question of the difference between data and knowledge.

For me knowledge is the ability to be able to interpret data purposefully. This can be illustrated by stock prices, for example. Any person familiar with the basic arithmetic could use mathematical computations according to strictly given formulas. This would be equivalent to a computer's way of acting in the usual stored-program-controlled processing of data.

However, very few people can interpret stock prices and draw certain inferences from their trend. One needs financial knowledge for this. Thus there is obviously a big difference whether one can add columns of figures or through a correct interpretation recognize and use the information contained in them. However, in both cases data are the starting point for further steps.

Thus transfers to the computer can make two statements: However, knowledge information processing based on data processing goes a quite decisive step further than this.

There are numerous kinds of problems for whose solution the proper application of knowledge to data is decisive. Planning, consulting, diagnosis, configuration or analysis, for example, fall under this heading.

A quite concrete example would be consulting in the investment of money. The problem itself can be characterized by figures, i.e., the amount of the sum to be invested, the term of the investment and also the expected minimum yield percentage. Typically one would present these data to a financial expert and expect from him proper inferences from the utilization of his knowledge.

Why should an expert not allow himself to be aided by a computer system in such activities? The emphasis of this question is clearly on the concept of support. It must not be the aim to replace experts with computer systems in as many cases as possible.

Pocket calculators can be cited as a comparable example. These little helpers often render valuable assistance in the calculation of mathematical formulas. The intellectually demanding task consists in the proper putting together of such expressions. This requires much greater mathematical expertise than the use of arithmetic operations. However, the latter can be performed by pocket calculators much more quickly and reliably than by the best mathematicians.

Nevertheless no one will seriously claim that pocket calculators would push this profession to the brink of insignificance. Quite the contrary. Many mathematical fields became interesting again or even for the first time through the availability of calculators. One thinks of the horrified reaction of the people someone among whom said perhaps 300 years ago that one day machines would be able to calculate far better than humans.

We find ourselves today in precisely this situation in the discussion of the sense or nonsense of so-called artificial intelligence. I repeat the statement I made above, that here it is a question of the computer processing knowledge. What should prevent us from the belief that one day the computer will be able to deal with knowledge just

as well as or in many respects perhaps even better than we humans? Would that be so bad anyway?

We should not forget that knowledge is one asset that one can share with others without one's losing it in the process. The computer could definitely prove to be a suitable medium for the storage and utilization of knowledge.

Totally without question many unsettled problems are still to be solved here. Promising beginnings exist and have resulted in noteworthy applications. I think it justified and at the same time necessary to investigate further the automatic processing of knowledge by means of the computer.

Professor Questions AI's Validity

92WS0460B Duesseldorf HANDELSBLATT in German 3-4 Apr 92 p K 3

[Article by Dr. Wolfgang Coy, professor, Bremen University; first paragraph is an introduction]

[Text] 3 Apr 92 (Karriere)—Professor Wolfgang Coy has been teaching computer science at Bremen University since 1979. His verdict on artificial intelligence is based primarily on the manifold risks and potentials for danger.

In spite of the obviously overdrawn equivocation for the concept of (human) intelligence, the term "artificial intelligence" still enjoys high esteem, that is in odd contrast to word formations like "artificial aroma" or "artificial teeth."

This esteem remains almost incomprehensible, examined closely and measured against the subliminal claim and the actual results. Without doubt artificial intelligence research permits interesting scientific insights, but an impression of computer intelligence in its own right, or even of self-confident computer intelligence, does not form.

Expert systems seem called upon to be AI's technical show product—to an extent that both concepts have merged with one another for many hope-happy users. However, their brief history has not fulfilled the great commercial expectations. Laboratory ruins ("for training purposes") or programs that seem trivial measured against the requirements of the "experts"—even and exactly when they may be clever examples of programmed solutions—have appeared. Disproportionately many of these programs cannot be justified economically. The absorbed costs have to be interpreted as the price of a steep learning curve.

How does it look with other fields of computer "intelligence"? Machine translation has been tried for almost 50 years. It has swallowed up billions according to competent testimony. The most differing insights into the character of grammars and language have been gained as results, but programs for everday use are in a deplorable state.

The machine recognition of speech is overpowered by substantial limitations in the number of recognizable words as well as the number of speakers accepted by the program. It seems so much more astounding, in light of these results, that BMFT [Federal Ministry for Research and Technology] now would like to support a priority with the goal of the online translation of Japanese-German telephone conversations. Here the policy is passing through only the flat part of the learning curve for applied computer science.

Only machine image processing is somewhat better in practice here than other AI techniques. However, that is mainly when it uses no ways of thinking of AI (for example, in current processes of machine character recognition, the visual inspection of impurities and production flaws or in automatic image evaluation). Certain results of close-to-AI engineering promise comparatively simple applications in automation technology that use optimizing classifiers in the form of neural networks or fuzzily modeled logic (fuzzy logic). However, here too the advances are basically due to the skill of engineering solutions that forego the claim that it is a question of theoretically demanding models of brains. Biologically oriented theories of neural networks remain of extremely limited value for their technical application, just as they do for sciences of the brain.

A wealth of scientifically interesting ideas that suffer from the poorly defined general subject "artificial intelligence" are forming in the scientific environment of AI. Underlying images of machine-humans remain unproven science fiction—generally meaningless, in individual instances the result of irritating naivete that in the end wastes resources, is falsely binding or can lead quickly to unnecessarily risky efforts. Technically acceptable, firm and fully understood results originate from such an environment more likely by chance.

Applied computer science is a productive force that fascinates by the seemingly effortless reproducibility of its main product, the program. However, this in no way includes the fast reproducibility of poorly understood methods, shaky hypotheses or research results that are successful only in a few isolated cases or in simple examples. Substantial risks arise for resources and humans when such preliminary results are hastily applied to serious problem cases.

The engineer's art consists not in the application of science but in the mastery under realistic conditions of scientifically grounded processes with their risks, impacts and consequences. The errors of the current view that engineering is just applied science show themselves sharply in the failure of large AI projects. The assessment of possible social, economic and ecological risks and the potential for danger is an essential duty of a specific engineering design that can be mastered only in general by science—and of necessity lags behind the latest results.

AI is one of the new technologies that is being propagandized without sufficient understanding and without precise knowledge of its functional capabilities and its risks under the alleged pressure of the international market and the actual pressure of government promotion policy.

Let the "healthy distrust" of experienced engineers and managers serve as an admonition: Sometimes poor solutions whose design is understood must be valued more highly than sometimes brilliant solutions that are not understood. Though this attitude may not satisfy scientifically, from the viewpoint of responsible behavior it cannot be valued highly enough considering the manifold risks involved in the application of computer science.

DEFENSE R&D

Sweden: New Radar Said to Penetrate Camouflage, Ground

92WS0505A Stockholm NY TEKNIK in Swedish 2 Apr 92 pp 12-13

[Article by Sven-Olof Carlsson: "Radar That Can See Underground"—first three paragraphs are NY TEKNIK introduction]

[Text] Right through camouflage. And straight down into the ground.

Researchers at FOA [National Defense Research Institute] in Linkoping are developing a new, entirely Swedish airborne radar that reveals hidden secrets.

The radar cannot be fooled even with modern stealth technology.

A new Swedish airborne radar is being developed at the Defense Research Institute in Linkoping. The FOA research group used space image technology as its point of departure for the creation of even sharper radar images of the earth's surface. The Carabas [Coherent All Band Sensing] radar picks up echoes that reveal the appearance of the ground and objects on it. The technology, which resembles photographic technology, produces an image that is both better and clearer than those produced by radar today. And the radar can even penetrate for some distance beneath the earth's surface.

Carabas was recently airborne for the first time. The very first data collection and image production gave great promise for the future.

"We knew it should function well in spite of the fact that it is all prototype technology. But we didn't know it would be this good from the very beginning."

So said Hans Hellsten, FOA research chief and leader of the Carabas radar project. His assessment applies to both the functioning of the prototype equipment and the quality of the first real images.

The idea for Carabas was formed in 1985-86. After five years of development and basic ground testing the prototype took to the air in January of this year to collect data that was recently processed into images.

Carabas is based on SAR [Synthetic Aperture Radar]. The synthetic aperture technique involves collecting a number of radar echoes in a certain flight distance (aperture distance) and storing them in a raw image. Later a computer analyzes and refines the image data into radar images with the desired image resolution.

Large quantities of SAR images transmitted from American, European and Soviet earth resources observation satellites in recent years have been turned over to image processing agencies such as Sweden's Satellitbild in Kiruna. These images are used for both civilian and military purposes.

However traditional SAR technology is inadequate for SAR images of Carabas quality. It operates in narrow bands and with short wave lengths, usually around 3 centimeters.

Carabas, on the other hand, operates with large band widths and wave lengths of 3-30 meters. An entirely new area for a radar of the SAR type and a prerequisite for providing the imaging and image resolution the researchers are striving for.

Hellsten's original research assignment did not really involve developing a radar system. He was trying to find concealed information in the SAR data that the Space Corporation in Kiruna obtained from the earth resources satellites. Such information should exist and could be extracted if the right methods were developed.

Hellsten searched in vain. But he also discovered the reason. The traditional narrow-band SAR technique was filtering out the potential extra information. This was done because of "speckle," a phenomenon that reduces the signal-to-noise ratio. Speckle makes SAR images poorer and must therefore be filtered out.

Retaining this extra information requires a different, broader wave length band and long-wave, coherent pulsated signals, the very SAR technique that is now called Carabas.

Hellsten sorted through the images that were recently processed in the division's vector processor. The images contained a total of 2,000 image points with a resolution of 100 x 100 meters. Then he pulled out one of the best SAR images taken from an earth resources satellite. It also had 2,000 image points, but a resolution of 20 x 20 meters.

"There is much more information in the Carabas image and it is clearer than the satellite image," he said. "Even though the satellite image has better resolution."

"Our technique gathers more information and utilizes it in a better way. And it will be even better when we improve the technique for processing the data. In the

next step we will produce images in which each image point corresponds to 15 x 15 meters of ground surface."

Even more information can be obtained from the collected raw data. Therefore computer processing is one of the areas where further development is needed.

The goal is to achieve a resolution of 2 x 2 meters. This requires not only refining the computer processing but also adjusting the data to allow for small changes in the movements of the airplane. Here too the radar's raw data actually contains the information that is needed. Calibration techniques must be developed here. In order to produce images with the highest resolution it is necessary to determine the precision of the image recording so that it corresponds to the precision of the airplane's movements at 0.01 m/s.

The capacity of the computer technology is also a problem, though perhaps not so much in an initial stage. Although Hellsten and his colleagues admit it can be somewhat trying to "shovel" data files in the gigabyte class in and out of the computer program just because of a simple handling error.

When Carabas is in the air the data recorder registers 100 megabits of information a second. It requires 100 seconds of taping to produce a radar image with full resolution. This means an information quantity of 500 megabytes or more. A sizable quantity of data to deal with even for the research group's rapid vector processor with a calculation capacity of 80 megaflops.

The images that have been produced so far contain around 2,000 image points (pixels) with a resolution of 1000 x 100 meters. A frequency width of only 2 MHz has been used. If one uses the entire amount of data contained in the raw image and the full frequency width, 80 MHz, surface resolution can be made 2,000 times better.

A third area to look into is the strength of the radar signals. In order not to interfere with other signal traffic the prototype utilizes a transmission power of only 20 mW. This corresponds to the power of a diode lamp. But transmission occurs on frequencies where there are already many signals. These wave lengths are used for the regular radio transmissions of Programs 1, 2 and 3, among other things.

"This low transmission power does not interfere with anything," said Hellsten. "One can listen to the radio only a few meters away from the airplane. There is no interference at all at a distance of a few hundred meters."

But the transmission power needs to be increased in order to achieve the best possible resolution. A resolution that may also be necessary when one wants to utilize the Carabas radar's capacity to see beneath the earth's surface. It can penetrate to a depth of 10 meters on the average and under certain conditions as far down as 100 meters.

Carabas records everything that has a solid substance, but electrically conductive objects and earth strata are especially clear. This is because metal objects, salt water and saline loam can act as dipole antennas and send back strong reflections if they are exposed to long-wave radiation.

This is interesting in both civilian and military contexts. One of the civilian uses involves soil analysis; for example it can be used to look for concealed water veins in desert regions. Militarily it can be used for such purposes as searching for underground facilities; the metal reinforcement in the concrete makes them show up extremely well.

"This radar technology is very hard to fool, even with modern 'stealth' technology. Ordinary radar can be deceived if one manipulates the shape and thus alters the statistically determined appearance of an airplane, for example," said Hellsten.

"The Carabas technology, on the other hand, depicts objects the way they really look, as photography does. Therefore it is hard to camouflage an object against this kind of radar. Either the object or the camouflage can be seen."

Photo Captions

1. p 12 (top): Carabas radar is carried by a small jet plane from FMV [Defense Materiel Administration]. Researchers have had to spend a lot of time designing and adapting the antennae to avoid jeopardizing flight properties. They have received valuable help from other aviation industries in the heavily aviation-oriented Linkoping area.

2. p. 12 (bottom): Innovator Hans Hellsten at the data recorder which records at least 500 megabytes per registration at a speed of 100 megabits per second.

3. p. 13 (top): The radar in the airplane transmits signals in short pulses and the echoes are picked up by the two arms of the antenna. The raw data are recorded on a high-speed tape recorder. The recorded data are later processed in a vector processor at the laboratory on the ground. The data can be extracted as a number of dots in a raw image. The dots form curved lines that correspond to the recorded objects. In a further step the processor compresses sets of dots into spots. With today's prototype technology the resolution is 100 x 100 m. The goal is to create images with a resolution of 2 x 2 m with the help of better antennas and computer analysis. The images will then bear a close resemblance to map images with objects clearly defined and accented.

4. p. 13 (bottom right): Tommy Jonsson of the research group with one of the antenna arms. The cover is sewn from mylar fabric and contains antenna elements of beryllium copper. On the ground a blower is used and during flight wind speed fills the antenna with air so that it holds its shape.

ENERGY, ENVIRONMENT

European Synchrotron: First Tests Begin

92WS0398A Paris AFP SCIENCES in French 20 Feb 92 p 23

[Article: "Particle Physics: First Tests of Grenoble-Based European Synchrotron (ESRF)"]

[Text] On 17 February, for the first time, and six months ahead of target date, a 6-GeV electron beam circulated, at 300,000 km per second, in the big 850-meter-circumference storage ring of the Grenoble-based European Synchrotron Radiation Facility [ESRF].

Built cooperatively, starting in 1986, among 12 European countries—France, Germany, Italy, United Kingdom, Belgium, the Netherlands, Denmark, Finland, Norway, Sweden, Spain, and Switzerland—at a cost of 2.6 billion French francs [Fr], the ESRF will enable the pursuit of research of all sorts in physics, chemistry, medicine, and advanced materials over the next 20 to 30 years.

Like some 50 other machines of the same order, planned or being built throughout the world, the Grenoble synchrotron opens windows to new sciences by enabling researchers to peer into microstructures by means of the X-rays it produces. These rays are 1 billion times as bright as all the conventionally existing ones, thus offering possibilities for unprecedented experiments designed to provide a better understanding of living and inert matter.

This first test, following as it does a series of preparatory operations carried out over the past several months at other stages of the machine, therefore marks an important date. The startup tests of the particle injector began on 17 February, when the first beams were injected into the storage ring, producing the first light within the system. "It will undoubtedly take a month to ensure that all operating parameters are within limits," says Mr. Jean-Louis Laclare, director of the project, "the time to finish all the many adjustments that have to be made."

The first tests of the inverter will take place in July. Then, around the beginning of 1993, tests of the first lines of light to be used in experiments. Each will correspond to an X-ray flux on the order of 25 watts per square millimeter, a very high level of power. Each will then strike complex optical systems, comprising special mirrors, before reaching the samples to be studied.

The first experiments will start around the end of 1993 or beginning of 1994, in the first of 32 lines of light planned for 1998 around the storage ring, where electrons and positrons, guided by hundreds of magnets and focused into a beam the thickness of a hair, will circulate at almost the speed of light in tubing exhausted to a very high vacuum.

As many as 60 scientific and industrial teams will be able to work at the same time at the ESRF in accordance with the terms of very strict five-year contracts. The teams will be obligated to share the results of their work with the scientific community of the member countries, except for those countries that prefer to keep their work secret, and these "will have to pay a very high price for that privilege."

In two years, the ESRF will be employing 430 persons, and 2,000 scientists will be going there every year to work. The cost of operating the Facility for the first four years has been estimated at Fr1 billion, 27.5 percent of which will be borne by France through its CNRS [National Center for Scientific Research] and its CEA [Atomic Energy Commission].

French Environment Institute Established

Paris AFP SCIENCES in French 20 Feb 92 p 45

[Article: "Establishment of French Environment Institute"]

[Text] Paris—On 19 February, Mr. Brice Lalonde, minister of the environment, established the first Board of Directors of the French Environment Institute [IFEN], a government agency installed at Orleans (Loiret), whose mission will be to coordinate and diffuse scientific data and statistics on the environment.

The Board of Directors is chaired by Mr. Yves Pietrasanta, professor of chemistry at the University of Montpellier (Herault), and the management of the Institute is headed by Mr. Jacques Varet, head of the Energy and Mineral Resources Department of the Ministry of Research and Technology.

The IFEN's initial budget will total 45 million French francs, and its starting staff will consist of some 30 persons. "The Institute was proposed by the National Plan for the Environment, and will perform the functions with respect to the environment that the INSEE [National Institute of Statistics and Economic Studies] performs with respect to the economy and social policies," said the minister of the environment.

German University Develops Laser-Based Plant Stress Gauge

92MI0440 Bonn DIE WELT in German 4 Apr 92 p 20

[Text] Plants, too, suffer from "stress factors" such as heat, drought, or pollutants. Before damage becomes visible, plants reduce their rate of photosynthesis. These invisible changes can be measured with a picosecond fluorimeter developed at Oldenburg University. It can be used in the field, so that the state of health of plants can be documented in situ. The core of the instrument is a diode laser that irradiates a small leaf section with extremely brief light flashes lasting just a few picoseconds (billionths of a second) via optical fibers. The light energy is picked up by the green leaf coloring matter,

chlorophyll, and then relayed in three directions: Most of it is used for photosynthesis, some is radiated as heat, and the rest is reflected as fluorescent light. The latter is absorbed by the sensor head of the apparatus, and fed along a second optical fiber to a photon meter and an online personal computer for analysis. With healthy plants, the fluorescent signal fades out after 300 to 600 picoseconds. However, when photosynthesis has been deactivated, the leaf continues to emit fluorescence for some 2,000 picoseconds. Signals lasting between 600 and 2,000 picoseconds indicate a damaged plant. With a complete measuring cycle comprising several million individual measurements, the fluorimeter produces a measurement curve of the fall-off in fluorescence. During this procedure the diode laser emits 500,000 light flashes per second.

Increased Subsidies for Wind- and Solar-Powered Plants Reported

92WS0488D Duesseldorf VDI NACHRICHTEN in German 27 Mar 92 p S23

[Article by Hans Dieter Sauer in the "Industry '92 Special Section": "Renewable Sources Take by Storm the 'Energy and the Environment' Focal Point of the Fair; Interest in Solar- and Wind-Powered Plants Growing Further; Rush for the Grants Program"; first paragraph is an introduction]

[Text] Duesseldorf, 27 Mar 92 (VDI-N)—Renewable energy sources, above all windmills and solar cells and collectors, are occupying an ever larger place at the Hannover Trade Fair. Their importance within the "Energy and the Environment" focal point has grown to the same extent as the people's interest in environmentally friendly energy sources has grown.

The sun, wind and biomass, seen as "energy sources for tomorrow" after the oil crisis, were neglected again in the eighties. With the proper output, they were to have been able to cover one to two percent of energy consumption in the Federal Republic by 1990 (without water power and firewood). The German Institute for Economic Policy and the Fraunhofer Institute for Systems Engineering and Innovation Research investigated this for the economics minister in 1983. In fact their contribution has remained less than 0.1 percent to date. However, a turnabout appears to be starting now.

Wind power is the showpiece. A new windmill was erected almost daily in 1991. Seven hundred facilities having a total power output of 60 MW were in operation at year's end. Wind power exploitation attained profitability through government support. The compensation for wind- and solar-generated electricity was raised from approximately 9 pfennigs per kilowatt-hour (pf/kWh) to 16 to 17 pf/kWh by the electricity supply legislation of 1 January 1991. In addition the operator of a wind power facility can obtain an additional subsidy of 6 pf/kWh from the federal research ministry's (BMFT's) "250-MW Wind" program. Thus, wind-generated electricity can bring in 23 pf/kWh.

According to calculations by Schleswag AG [German Stock Corporation], however, electricity can surely be generated for 20 pf/kWh by means of windmills of the 300-kW size class at locations having an average wind speed of greater than 5 m/s. These prospects have unleashed a downright rush for grant money. Applications for 5,221 facilities with a total power output of 686 MW had been received as of 31 December 1991.

Municipalities and districts cannot identify sites for windmills at all fast enough. "The approving authorities' procedure is slowing down the tempo," Horst Wollmerath of the Wind Power Producers Association observed. Nevertheless the aimed-at capacity of 250 MW will probably be reached already before 1994. With 400 billion kWh per year, wind-generated electricity would then cover approximately one-thousandth of Germany's electricity demand.

Space for wind power facilities could soon become scarce with further growth. For 10,000 250-kW windmills would indeed be required in order to generate one percent of the electricity from wind. "Therefore, wind power facilities in the megawatt range will also have to be available for the large-scale generation of electricity." Hans Heino Moeller of Schleswag agrees with other experts in this assessment. Because more energy can be harvested from a given area with large windmills than with small rotors. The wind speed increases with height and the air current's energy content increases in proportion to the wind speed raised to the third power.

However, unfortunately the investment costs also grow superproportionally with large facilities. While they are at 2000 German marks [DM] per kilowatt between 200 kW and 400 kW, they multiply in the megawatt range. DM8000/kW are designated for the largest German facility, the 1.2-MW rotor on Helgoland. If the largely technically stipulated cost progression cannot be contained by means of lightweight-construction materials or new designs such as the vertical-axle HM rotor, wind power exploitation will soon encounter its limits in the densely populated Federal Republic because of lack of space.

One is still a far cry from this in the exploitation of solar energy, even if the installation of collectors, as is now becoming visible, should grow strongly. Space on rooftops abounds at the present time.

Collector Manufacturers at Their Capacity Limit

Nineteen ninety-one was a good year for collector manufacturers. "According to my information," says Ludwig Klehr of the German Society for Solar Energy, "all companies are working at the limit of their capacity." The total installed collector area is somewhere between 300,000 and 500,000 square meters.

The data on the newest trend differ widely. The German Solar Energy Trade Association, the alliance of collector manufacturers, reports that around 200,000 square meters were installed in 1991, triple the amount of the year before. However, that is quite impossible according to the "Statistics on the Utilization of Renewable Energy Sources," that ended in 1990, prepared for BMFT. According to them the installed area dropped in 1990 back to 23,000 square meters from the all-time high of 37,500 square meters reached in 1989.

Approximately two-thirds of collector production is used for solar hot-water facilities in private homes, and the rest in larger projects like hospitals or gymnasiums. Although it is a question of a simple technology, the investment cost is high. Heating costs of between 30 and 50 pf/kWh are calculated for facilities in single-family houses.

The federal government is holding back with subsidies. The lands are granting subsidies of between 20 and 50 percent instead. However, even with this it is as a rule more expensive to heat water by means of the sun than with oil and gas. Only in swimming pools is this not the case. The pool water can be heated inexpensively by means of unglazed black plastic absorbers. According to a list by Reiner Kroy of the Center for Solar Engineering, use has since been made of these at 140 public swimming pools.

Sweden is among the leaders in the thermal exploitation of solar energy. The sun is being used for the central heating of housing developments there by means of large collector arrays and underground storage facilities. The cost of solar heating was able to be dropped to 10 pf/kWh by the development of large-surface cost-effective collectors.

High investment cost is still hampering photovoltaic generation's breakthrough in Germany. In any case for the present there is no shortage of potential installation areas. There are enough house roofs available, for instance. Very simple facilities are already offering themselves for use in developing countries.

There are great expectations for photovoltaic generation, but it is still a far cry from being competitive as a supplier of line current. The investment cost ranges between DM20,000 and DM25,000 per kilowatt. The electricity cost calculated according to this is influenced strongly by which long-term interest rate and which service life enter into the calculation. For instance, figures of between DM1.50 and DM2.50 per kilowatt-hour, depending on the amount reported. A capacity of about 2.5 MW has been installed in the Federal Republic. Approximately one-half belongs to four large facilities of the electric power companies.

Similar to wind, the broad testing of photovoltaic generation has been initiated through the so-called "1000 Roofs Program." Divided among the individual federal lands, 2250 single- and two-family houses are to be equipped with between 1-kW and 5-kW solar generators. The subsidy is not to be tied to generation in this case, but an investment subsidy of 70 percent will be granted. However, even with this solar-generated electricity will still cost approximately 60 pf/kWh. Nevertheless the response has been great. Thirty thousand inquiries and 2,000 formal applications have been received thus far. Two hundred and twenty-one facilities have since been installed with a capacity of around 500 kW.

Solar Electricity for the Third World

Remote from electrical power systems, photovoltaic generation has in many cases, ranging from buoys and signaling devices to remote houses, proved a success as a source of electricity. In spite of its high cost, in the Third World it is the most satisfactory way to provide a minimum supply of electricity to households in non-electric rural areas. Small facilities having a power output of 50 W and up that supply electricity for a transistor radio and some lamps are being well received, because electric light means a substantial improvement in living conditions. The original cash outlay is high, but in the final analysis there are no greater financial burdens than those of the on-going expense of batteries and candles and kerosene for lighting.

Benno Schmidt-Kuentzel of the Society for Technical Cooperation (GTZ), who is in charge of a project for the promotion of photovoltaic generation in Senegal, knows that many families would purchase a system provided that they would be able to receive a loan for it. But they do not have this possibility. "The biggest obstacle to the rapid spread of small photovoltaic systems in the Third World," in his opinion, "lies in the absence of a rural credit system."

Activated Coke Filter To Reduce Emissions at German Incinerator Plant

92WS0498B Duesseldorf VDI NACHRICHTEN in German 20 Mar 92 p 30

["Dioxin Trap Built In"]

[Text] VDI-N, Duesseldorf, 20 Mar 92—Duesseldorf now has a clean incinerator. Since the activated coke filter went into operation, the dioxin and furan emissions from the incinerator have now been reduced to something under 0.1 nanograms (billionth of a gram) per m^3 of exhaust.

"We are the first in Germany to have such an incinerator," Matthiesen boasted when the plant was being commissioned a few weeks ago. The technology that was introduced in Duesseldorf was an activated coke filter incinerator—the only major technical process currently available to reduce dioxin and furan.

The test plant is inconspicuous from the outside. In a 32 m high and 14 m wide tower the exhaust streams through two parallel, activated coke filter towers, each containing a 1.5 m high filter bed. In the process, organic pollutants like dioxin and furan, as well as volatile heavy metals

like mercury are adsorbed in the charcoal. In addition, according to the Duesseldorf department of public works, the coke reduces the sulfur dioxide and hydrochloric acid to below the detection limit. Some 180 t of charcoal purify about 480,000 m^3 of exhaust an hour. Spent or saturated charcoal is continually being withdrawn and replaced.

The Duesseldorf incinerator is just the beginning. Matthiesen announced that all 26 existing household and special incinerators in North Rhine-Westphalia (NRW) will be retrofitted by the mid-1990s. According to the North Rhine-Westphalian minister for the environment, all new incinerators will have to have correct char filter to meet the residual dioxin limit. "The total investment for these measures will be about 2 billion German marks [DM]," Matthiesen estimates.

But the minister for the environment did not on his own initiative voluntarily activate the anti-dioxin program. In the 17 ordinance to the Federal Emissions Protection Law (17. BImSchV), the Federal Ministry of the Environment decreed in December 1990 that household incinerators (MVA) will only be permitted to emit 0.1 ng of dioxin and furan per m^3 of exhaust. Existing incinerators would have to be retrofitted with activated char filters by the end of 1996; new incinerators would have to have the filters.

The disposal of filters saturated with pollutants is a central question in all filtering processes. In Duesseldorf the saturated coke will be burned in the Lausward municipal power plant at 1,200°. At these high temperatures, the organic pollutants decompose, and the heavy metals are retained by the filter system. In the coming year, Duesseldorf plans to recycle the heavy metal-saturated charcoal. The heavy metals will be desorbed from the charcoal and the char reused. Pilot tests to that end are already underway.

France Supports "Green" Fuels

92WS0535A Paris L'USINE NOUVELLE in French 23 Apr 92 p 23

[Article by Jean-Michel Meyer: "Industrialists Switch to the Agricultural Pump"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Biofuels offer new ways to use fallow land, reduce CO_2 emissions, and cut our dependence on energy.

It is well known that in France we have agricultural, not oil, fields. Green fuels, which are still costlier to produce than fossil fuels, have just been given a significant shot in the arm. The 1992 appropriations bill exempted biofuels from the domestic tax on oil products (TIPP) for a five-year period; the bill has just been followed up by an interministerial decree issued in late March that lays down the rules for the tax break.

The cost of the biofuels now ranges from 3 to 5 French francs [Fr]. The fuels consist of an ester that is made from rapeseed or sunflower seed oil—either undiluted or mixed with gas oil—and ethanol, which is produced from sugar beets and grains and then mixed with the gasoline.

Agricultural subsidies and production forecasts are going to lower the costs of producing the fuels. And as a bonus, the tax exemption will enable producers to sell ethanol for about Fr3.30 a liter. That compares to Fr4.15 for super leaded gasoline (on which a Fr3.20 tax is levied) and Fr3.41 for a liter of ester, against Fr2.63 for gas oil that includes a tax of Fr1.67.

The government's measure foreshadows an EC plan to cap the taxation of biofuels at 10 percent of the rate in effect for fossil fuels starting 1 January 1993.

The tax breaks have made for some novel bedfellows: Robbe—a subsidiary of Sofiproteol, which is the financial company of the French oil and protein industry—will produce 20,000 metric tons of ester starting next September. Sofiproteol has exclusive rights to manufacture diester (a contraction of diesel and ester), which was developed by the French Petroleum Institute.

Renault and Peugeot Company have said they favor green fuels, provided that they do not account for more than 5 percent of a fossil fuel mixture in the case of gas oil and 1 percent for super unleaded gasoline.

Agricultural producers and manufacturers (Renault, RVI, Peugeot, Elf and Total) have teamed up to conduct "engine tests" on the viability of the diester-gas oil mixture. The results will be known in late September and will determine whether diester is distributed at the pump.

The agreement is still a fragile one, so greatly do the different players' interests diverge. One one side stand producers of sugar beets, grains, and vegetable oils, who encourage the EC's plan to tax CO_2 emissions to gain new outlets for their products. On the other are the oil producers, who have jumped in to be ready and to forestall any taxation when the politician makes green fuels mandatory. It is an astonishing mixture of genres—an explosive one, in fact.

FACTORY AUTOMATION, ROBOTICS

Germany: Bochum University Develops Autonomous Robot System

92MI0410 Bonn DIE WELT in German 28 Mar 92 p 20

[Article by Norbert Lossau: "A Small Robot Looks Out on the World: Bochum Scientists Have Developed an Autonomous Vehicle"]

[Text] His name is Marvin; he is small and stocky, weighs around 200 kilos and trots slowly through a research laboratory at Bochum University. He stares whenever a pretty woman crosses the room. However,

Marvin is not macho. He is a robot who moves around on small wheels—an "autonomous vehicle," as his makers put it. His weight is mainly due to the heavy lead storage batteries in his stomach, which make him independent of mains electricity.

The name Marvin stands for "mobile active robot system for visual information processing in a neural architecture," and his spiritual father is Professor Werner von Seelen. The research work involving Marvin has the very ambitious aim of developing robot systems capable of using optical "sensory impressions" to find their own way around a natural environment. The scientists working with Marvin define a natural environment as the complex everyday world in which all kinds of people and objects may be encountered in every possible combination and a variety of lighting conditions.

The Bochum robot has two swiveling camera eyes, whose sophisticated mechanical suspension enables them to turn in any direction in an instant. They are controlled by an "attention circuit" that pays special attention to moving, or more precisely, all self-propelled objects.

This is where Marvin uses his visual tracking movement, by no means a simple technical achievement, to ensure that the object of his interest remains within his field of vision. His eyes follow it unrelentingly. This is the procedure we use, so naturally and involuntarily that we do not realize it, when we focus on a moving object; this is what makes it so hard to "teach" a technical device what to do.

Focusing on objects is one thing; but identifying them is another matter. The Bochum researchers are trying to teach the little vehicle to do this as well. They feed Marvin's on-board computer, whose circuit design imitates the mechanisms whereby biological nerve systems function, with video images of objects and people, which Marvin subsequently identifies by himself in the course of his reconnaissance sorties. For example, he can be given a video "wanted" poster of a laboratory worker and instructed to seek him out.

Marvin is far from being just a highly sophisticated toy for scientists, however. There are of course a variety of interesting applications on the horizon, awaiting the technologies that Marvin embodies. The domestic robot, capable of doing the vacuum-cleaning or watering plants on its own, is not in Von Seelen's view a viable proposition in the foreseeable future, as "the technology it requires is just too complex." There is already a demand, however, for autonomous robots like Marvin for specialized applications in industry and research, for example operating in radioactive environments.

The ability to keep moving objects in sight could also be useful in road traffic management. Von Seelen and Volkswagen have jointly developed an automatic speed control system for cars: A camera system keeps the car ahead in sight and measures the distance between it and the vehicle on which the system is mounted. The data is then used to control the speed of the car, ensuring that the safety distance between the cars is appropriate to their speed at all times.

LASERS, SENSORS, OPTICS

Integrated Optics Applications Reviewed

92WS0488B Duesseldorf VDI NACHRICHTEN in German 27 Mar 92 p S20

[Article by Richard Sietmann in the "Industry '92 Special Section": "Integrated Optics Finding Its Way in the Market; A Stepchild of Microelectronics Is Becoming Emancipated; Telecommunications, Sensor Technology and Computer Technology Are the Main Areas of Application"; first paragraph is an introduction]

[Text] Duesseldorf, 27 Mar 92 (VDI-N)—Computer and telecommunications applications for large companies and sensor applications for small and medium-sized companies—this "division of labor" is becoming visible in the application of integrated optics. There will be numerous products having optoelectronic elements to be seen at the Hannover Trade Fair.

Sometimes one speaks of "integrated optics" and sometimes of "integrated optoelectronics." As always in young, dynamic disciplines, the terminology is still a little undisciplined. However, recently it has been concerned with the fabrication of miniaturized optical devices by means of planar technologies, by analogy with microelectronics, and the combining into integrated-optical circuits of several such components on a single common substrate in combination with electronic devices.

These can be passive structures like striplines, lenses, mirrors, polarizers, beam splitters, etc., in glass or in electro-optical crystals like lithium niobate, or active elements like semiconductor lasers and photodiodes. The latter are constructed mostly from the III/V-compound semiconductors gallium arsenide and indium phosphide. The aim is optoelectronic-integrated chips (OEICs) along the lines of ICs in microelectronics.

"The biggest application field will be optical communications engineering," expects Wolfgang Sohler, physics professor at Paderborn University - Cluster College. The reason is obvious: The enormous transmission speed and quality of optical fibers will be able to be used in telecommunications first when there are no longer any bottlenecks in the form of copper conductors having a limited bandwidth from terminal to terminal, and—in the ideal case—the optical fibers are brought as far as the terminal port.

However, then at the latest OEIC devices will be worth the money for optoelectronic signal conversion and be required in large numbers as transmitting and receiving chips—a hotly contested market in which the first settings of the course are taking place already today in

research and development and which will be reserved for quite powerful large companies. Because the possibilities for the specification of OEICs are extraordinarily manifold, and the designing of them, according to Sohler, "requires experienced personnel and in most cases heavy investment in technical facilities."

Sohler, he is together with Raimund Volk the author of the study "Integrated Optics—Potential for Small and Medium-Sized Manufacturers and Users of Microsystems," published by the VDI/VDE [Association of German Engineers/Association of German Electrical Engineers] Applied Computer Science Technology Center in Berlin, however, sees, in addition to the mass markets for telecommunications devices, plenty of market opportunities for small and medium-sized businesses.

In the communications applications environment, for example, and metrology and assembly and wiring processes, for instance. As soon as OEICs come on the market appropriate equipment for quality assurance or as-found tests which record the characteristics of devices will also be required. And the more optical fibers are used in the field of local area networks—DBP Telekom [German Federal Postal Administration—Telecommunications Services] plans to install 200,000 optical fiber subscriber lines already in the coming year and 500,000 each in the two years to follow—the greater the need for rugged measuring instruments for use in the field, that quickly and without complication record the parameters of transmission links and are able to represent the signal's modulation characteristics over time and space.

"Another example of the profitable application of integrated optics could be the development of an optical power measuring instrument that contains an integrated-optics electronically tunable wavelength filter," Sohler believes. "It would be possible in this way to measure selectively and very simply the power components of light of various wavelengths." Such a multichannel analyzer would be important for the testing of so-called WDM [wavelength division multiplex] links and networks in which light of various wavelengths renders possible several parallel transmission channels at the same time in an optical fiber.

However, beyond telecommunications, it is to be foreseen that integrated optics will pervade increasingly more strongly classical optical measuring techniques like interferometry and spectroscopy—traditionally a domain of small and medium-sized companies. "In general this trend will result in smaller, more reliable, in many cases more powerful, and also less expensive measuring instruments in great numbers," Sohler expects.

Measuring Sensors Will Be Joined to Microsystems

Measuring sensors as a classic combination of optics, mechanics and electronics offer themselves outright for the respective planar miniaturization technologies of microelectronics, micromechanics and integrated optics, especially since—more likely over the long term—the possibility will present itself of integrating into complete microsystems on single substrate systems that thus far have been constructed from discrete components.

Integrated-optical inteferometers in the capacity of vibration meters and motion and position sensors promise greater ruggedness and better service life than conventional measuring instruments constructed from three-dimensional components for application in machine tool control systems in harsh environments. In addition, integrated-optical interferometers can also serve as temperature, humidity, pressure and field strength sensors. However, their development is still in its beginnings. In many cases only laboratory models exist. "However, an opportunity for small and medium-sized businesses could exist in taking up a particular idea and developing a sensor wholly targeted toward full development," Sohler believes.

Optical sensors, especially optical fiber sensors, have, in addition to their compact design and low weight—above all because of the physical separation of signal processing—substantial merits in critical environments: The fact that no sparks can form in them at contact points or when fibers break signifies an additional safety gain in automation in refineries, in chemical plants, in mining and in other explosion-hazard fields.

In addition they are immune to electromagnetic interference, such as occurs in the environment of machines having high connected loads and contact ratings. This merit plays a role also in quite different applications. For instance, under the trunk route influence of suburban express trains and subways, the highest requirements are placed on the security of data transmission for signals and signaling devices along the railroad line. Optical fibers remain immune to inductive interference where conventional signalling cables lie within the radius of influence of traction current cables.

The third major field of application for optoelectronics, in addition to telecommunications and sensor technology, will be computer technology, particularly in optical bus systems. Today transistors have switching times of about 10 ps, but fast computers operate with clock pulse durations of only 10 ns. This enormous discrepancy of a factor of 1000 has its explanation in the time lag induced by the conductor path wiring.

A remedy is offered by optical connection technology, by the fact that the chips are placed at right angles to one another and signals from the laser diode array of one chip, that are in the form of light rays or pulses, are directed to the photodiode array of the opposite chip across the free space in between. According to AT&T's estimates, the optical wiring of printed circuit boards is to be expected as of 1995, and the optical wiring of chips as of the year 2000.

According to the estimates of experts, optoelectronics is about 15 to 20 years behind microelectronics. It is a

"stepchild of microelectronics," thinks Berlin physicist Klaus Thiessen. Though already irreplaceable today in input and output transducers, however it shows clear shortcomings vis-a-vis the established silicon chip technologies: Many basic materials and many special technologies and specific embodiments, each of which has to be tailored specifically to the function, are characteristic. "This is just hard to make financial backers and sponsoring agencies understand."

A technology's complexity is certainly an obstacle to its commercial exploitation. However, it is also "a great challenge to the imagination of researchers and developers," as Paderborn physicist Wolfgang Sohler believes. And an opportunity: Whoever masters the complexity will have a natural advantage in the market against competitors.

MICROELECTRONICS

European Semiconductor Industry Assessed, Future Discussed

92WS0488A Duesseldorf VDI NACHRICHTEN in German 27 Mar 92 p S20

[Article by Jens D. Billerbeck: "Competitiveness of Many Branches Depends on Microelectronics; Chips' Share of Value in the End Product Growing Steadily; the Trade Deficit Is Growing in Spite of the Rush to Catch Up Technologically"; first paragraph is an introduction]

[Text] Duesseldorf, 27 Mar 92 (VDI-N)—The influence of chips was immeasurable at the now-ended CeBIT show. There is hardly a computer or a communications industry product that would be imaginable without them. But microelectronics has become a key technology also in the fields of automation, power engineering and environmental engineering, and with that chips also have a secure place at the Hannover trade fair.

The immediacy with which developments in microelectronics are being reflected in information technology products may have contributed to the fact that this year quite a few chip manufacturers and service providers in the field of application-specific circuits were to be found at the CeBIT show. A steady drifting away of this branch could already be seen in past years at the Hannover trade fair. However, it is taking a steadily greater part—to a great extent unnoticed—in the products exhibited themselves.

Erich J. Lejeune, chip broker and "enfant terrible" of the FRG's microelectronics scene, brought it to the point at a management seminar in Budapest: "Viewed as a whole, this is how it looks: German industry bought 4 billion German marks [DM] worth of chips in 1988 and with them made end products having a total value of DM600 billion. This sum represented at that time around a quarter of the gross national product."

"Semiconductors are the oil of tomorrow." The Thomas Group offered this quotation from Jerry Sanders, chairman of chip manufacturer AMD, at the start of a study of the future of the European semiconductor industry. The raw material character of a great many semiconductor devices was likewise stressed in quite a few discussions during the CeBIT show, but attention was also drawn emphatically to the fact that know-how, that it is essential to obtain and further develop in Europe too, is required in order to produce this raw material.

Dependence on individual suppliers—as with the raw material oil—could have devastating consequences. Lejeune: "What will happen if accessibility to a major part of the raw material chips is boycotted? The economy as a whole would collapse. A good 25 percent of people would be unemployed immediately, and others later."

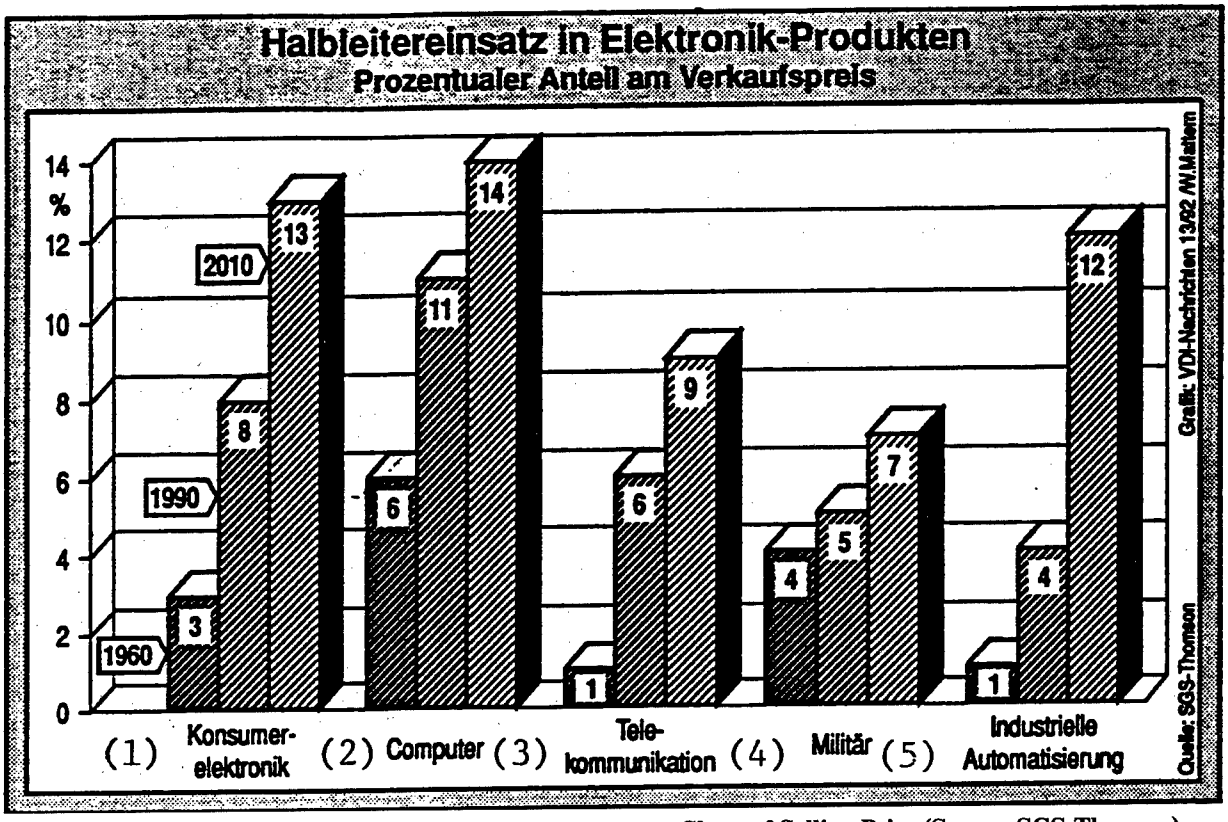
Surely a very extreme scenario. But the recently published study by the Thomson Group shows quite clearly the steadily growing share that semiconductors have in the value of industrial products. In automation, for example, their share grew from 1 percent of the selling price in 1960 to 4 percent in 1990 and will reach the 12 percent mark by the year 2010. "Twenty-five percent of all of industry's investment will have something to do with electronics in the year 2000," it reads in the study, "compared with 5 percent in 1960."

The competitiveness of industry as a whole thus depends to a great extent on competitiveness in electronics. But Europe shows weakness here. But Dr. Hans Friedrich of Siemens AG [German Stock Corporation] sees the electronics industry becoming the largest sector of industry in Europe too by the year 2000, its trade deficit, however, being already at present $35 billion, and having grown to $70 billion by the end of this decade.

Friedrich says, "The electronics industry's productive capacity is related directly to microelectronics. But Europe is a microelectronics import region." However, Friedrich also says that the European chip manufacturers have maintained their world market share in spite of stiffer competition and that the technology gap between them and their Japanese and American competitors has been to a great extent closed today.

The technological race will continue to be contested successfully with the JESSI [Joint European Submicron Silicon Initiative] project, a EUREKA [European Research Coordination Agency] research program. After an 18-month starting phase, the ambitious project entered its main phase with the start of this year. JESSI President Raimondo Paletto gave on the occasion of the CeBIT show an all-in-all positive status report, but his clear policy reminder was not to be ignored: The importance of chips for industry as a whole is still being underestimated by many people in positions of responsibility in Europe, he says.

What is required, according to the Thomson study's summary, is a European industrial policy taking the following three approaches: an interest coalition between



Use of Semiconductors in Electronic Products: Percentage Share of Selling Price (Source: SGS-Thomson)
Key: 1. Consumer electronics 2. Computers 3. Telecommunications 4. Military 5. Industrial automation

suppliers and purchasers of microelectronics, the mobilization of financial resources for research and development, and a fundamental change in the rules of competition in order to counter the present imbalance in trade with Japan, for example.

Europe: Lack of Semiconductor Production Capability Reduces Industry's Competitiveness

92WS0498C Duesseldorf VDI NACHRICHTEN in German 20 Mar 92 p 3

[Article by Rolf O. Karis: "Europe Has to Develop a Functioning Chip Industry"]

[Text] VDI-N, Hannover, 20 Mar 92—Does Europe's computer industry still have a chance? Yes, it does if industry is willing to enter into more cooperative ventures and if the political heads of Europe finally recognize and accept the importance of this key technology.

Are the computer and memory chips produced in Europe the indispensable basis for an independent, competitive computer industry? Or can they simply be viewed as a buyable raw material? These were the crucial questions asked at the panel discussion arranged by Wirtschaftswoche, Duesseldorf. CeBIT '92 offered the ideal platform to debate the future of the European computer industry. Before an audience of some 350, the blue-ribbon panel, moderated by chief editor Dr. Volker Wolff, tried to find answers to these burning questions. Andreas von Bechtholdsheim from distant California, the founder and vice president of Sun Microsystems in Mountainview, assessed the prospects of a European industry much better than Jaques Delors, the president of the EC Commission. Whereas Delors forecast the total collapse of Europe's efforts, Bechtholdsheim gave Europe's computer-makers a very good chance in the international competition. To be sure, there would have to be some changes both in the companies involved as well as in political and policy objectives before the European industry would be able to meet Japanese and American competition.

Bechtholdsheim described the situation: "What has happened in the last 10 years is that the operating speed of the processors has increased a hundredfold, while the prices have remained the same." "Consequently," as the president of Sun sees it, "users have had the good fortune of being able to get the same amount of computer performance as before, but at a hundred times cheaper."

But the amount of investments required in the development and production of the next generation of chips has

risen substantially. Bechtholdsheim cited a figure of 100 million German marks [DM] for the development of one chip generation. The requisite production facilities add DM1 billion to the costs. And these costs could only be made up if a sufficiently large market existed. In his opinion, Europe is a large enough market to do this. Unfortunately, at the present time, the market has been taken over, chiefly by Japanese producers whose technological and competitive advantage appears to be beyond the reach of European companies.

Falk D. Kuebler, head of Parsytech, spoke of a "rabbit-snake syndrome." The syndrome has gripped the European electronics industry and robbed it of any hope to win. As Kuebler put it: "Europe appears to lack the will to prevail. No one even thinks of success anymore, although the future is molded by expectations." The spontaneous manifestations of approval by the attendees obviously supported Kuebler's assertion that considerable ground could be won back in the international computer market, if only the companies made the necessary efforts.

Bechtholdsheim also conceded good prospects for the future to the company representatives in attendance: "If she invests in new products, new markets, and new technologies now, Europe has good prospects for the future."

Bechtholdsheim recommends more cooperation between producers and users, more efficiency and flexibility, and a mutually agreed upon community of interests to make Europe competitive again in the chip and computer industries. Siemens and IBM-Deutschland, represented on the panel by Hans-Olaf Henkel (chairman of IBM-Deutschland's management staff) and Dr. Hans-Dieter Wiedig (chairman of the board of Siemens-Nixdorf Information Systems [SNI]), gave just such an example of the type of alliance needed when they cooperated in the successful development and production of the 64-Mbit-Dram.

Both Henkel and Wiedig made it perfectly clear that neither of their companies—acting alone—would have been in a position to come up with the funding that was necessary to develop that chip generation. But even the alliance of these two industrial giants also had to rely on government support. Europe apparently lacks the sense to see that it is much more important and in the interest of all branches of industry to invest in the development and production of computer chips than it is to continue the escalating agricultural subsidies for more potato chips. Not just the computer industry is dependent on chips, but all industries in which the use of this electronic "miracle worker" is needed to provide the ability to compete.

For these reasons, the Europeans fear unilateral dependence on Japan as the only country that can produce standard chips. No one wanted to agree with the point made by Karl-Heinz Achinger, chairman of the management board of Debis-Systemhaus GmbH, that Japanese chip producers also compete among themselves. The simple fact of being solely dependent on Japanese producers automatically entails a direct dependence of European computer producers on their southeast Asian competitors.

IBM boss Henkel is convinced that Japanese chip manufacturers will always service their Japanese customers first. He argues further: " Do not forget that this technology is not limited just to data processing." Seventy-five percent of the semiconductors produced today have nothing to do with data processing. They are used in automobiles, refrigerators—practically everywhere. Henkel continued, "In my opinion this is a great threat for all of Europe's industries. With that in mind, discussion of Europe's ability to be competitive as a producer of semiconductors must stay on the agenda."

Wiedig, the head of SNI, agrees. He too believes that Europe must have her own semiconductor industry. Wiedig therefore strongly advocates that all national and international promotion efforts in Europe be synergized. "The step from 4 Mbit to 64 Mbit required an investment of far more than US$1 billion in production facilities," his colleague Henkel added. The question as to who should bear this burden leads Henkel to wonder it the monies that the EC Commission is now spending on a variety of projects are being invested the best possible way. "I must say quite clearly that IBM alone could not have produced the 64-Mbit chip. Siemens agrees." Even acting together, both of these large companies—with an eye to national and European funding—emphasize that "we do not know if we can pull it off, at the moment it appears that we cannot."

Siemens' Chances in 64-Megabit Microchip Competition Assessed

92WS0536A Munich SUEDDEUTSCHE ZEITUNG in German 30 Apr-1 May 92 p 65

[Article by Anneliese Eckart: "Race for the 64-Megabit Chip; With X-Ray Lithography, Europeans Are Using the Most Modern Technology"]

[Text] "Around two-thirds of the German gross social product depends on microelectronics," the general manager of the Central Association of the Electrical Engineering and Electronics Industry (ZVEI), Franz-Josef Wessing, said recently. Western Europe uses around 18.4 percent of all the chips produced in the world, but contributes only 11 percent to worldwide production. Still, the pioneer in chip development continues to be Japan: Half of all semiconductor chips come from there. The Japanese are even more dominant in a special variety—memory chips. Here, with a market share of a good 90 percent, they rule the world market.

Memory chips are considered the driving force of technology, especially so-called dynamic memory, or DRAMs [dynamic random access memories]. Whoever is the first to master the technology of the latest DRAM

generation has good prospects as the market leader for other memory chips as well.

In the mid-1980s, the Europeans and Americans sounded the attack on the Japanese bastion. However, the companies from the Land of the Rising Sun remained ahead in the race for the megabit chip (a million bits on one chip), as well as for the 4-megabit chip (the development of memory chips always proceeds in progressions of four). The Europeans and Americans were forced to buy production know-how from the Far Eastern competition.

Then, everything was supposed to change. Europe's chip engineers created the JESSI [Joint European Submicron Silicon Initiative] joint research program. One of the main goals: the development of the memory chip of the generation after next—the 64-megabit chip. To be precise, this chip stores 67,108,864 bits, making it able to hold the contents of more than 3,000 closely written DIN A4 pages. The superchip should go into mass production by 1996, according to the JESSI plan. The Japanese, however, pushed development forward at such a fast pace that they have announced the first 64-megabit chips for 1994.

Thus, in 1990 Siemens AG, which up to then had been lagging far behind in the megabit race, broke rank with the JESSI project and joined forces with the U.S. computer company IBM. Siemens executives still hope that this cooperative arrangement will allow them to make up for the two-year lead enjoyed by the Japanese. Because one thing is still true of the chip market: The first one to get there cleans out the market. Because of the rapid drop in prices, latecomers have no chance of recovering their costs.

And the development cycles are getting shorter and shorter. The 4-megabit chip, which was introduced in 1989, is slowly becoming the standard, while its successor, the 16-megabit memory chip, is supposed to be ready for mass production in early 1993. A good year later, the 64-megabit chip should then be ready—and it is around that chip that the real battle for dominance in the chip market is being waged. And companies are already arming themselves for the 256-megabit chip.

Prototypes Presented

The IBM/Siemens duo still appears to be holding up in the race. Although Japan's Hitachi Ltd. was the first to present a prototype, in February of this year, Siemens and IBM followed with their own lab samples ("first silicon") as early as March. In Siemens' opinion, the German-American cooperative arrangement is thus assuming an "advance sentry role," because a stage closer to production has been achieved compared to the Hitachi lab sample.

The two companies have yet to announce a schedule for introduction of the chip on the market. The pilot system for production of the chip is located at IBM's newly erected Advance Semiconductor Technology Center in East Fishkill, near New York. The site for joint work on chip design, test engineering, and package development is in Essex Junction, Vermont. The development system is based on preliminary work done by both Siemens and IBM.

It has not yet been determined where the chips will be mass-produced beginning in 1995. At present, politicians and industry are wrangling over the site. Federal Minister for Economics Moellemann favors Dresden. IBM and Siemens want to start up production at an IBM plant in Sindelfingen or in Corbeil-Essones, France, where the joint 16-megabit chip is also being produced. In any event, the Sindelfingen IBM plant is in charge of planning production of the 64-megabit chip and of the logic chips.

In order to defy the Japanese with the 64-megabit and especially with the 256-megabit chip, the IBM/Siemens duo is betting on a new manufacturing technique: X-ray lithography. This is intended to replace lithography using ultraviolet light, which has been used thus far. With this method, the chip manufacturers can cleanly apply the micro-maze of individual conducting paths and transistors to silicon, the raw material of chips. A mask with the pattern of the planned chip structure is placed over the silicon chip, which has been coated with a light-sensitive lacquer. The light falls onto the chip from above and through the mask, and etches the lacquer wherever the pattern casts no shadows.

However, the tinier the structures to be etched become, the more disruptive the effect of light diffraction is. Light waves are around 0.5 micrometers (a millionth of a meter) wide, but the intervals between the conducting paths in the 256-megabit chips will be smaller than 0.3 micrometers. This level of precision can be achieved with ultraviolet light only by using very complicated and expensive tricks.

In contrast, X-ray lithography is cheaper—and more precise, because X-rays have much shorter waves than light, and thus allow more minute structures. Nevertheless, initial investments are extraordinarily high. IBM is currently investing some $3 billion in this technology, which includes a superconducting ring synchronotron as the source of radiation. Individual process steps should be assumed by the synchronotron even with the 64-megabit chip.

Possible Lead

And that makes IBM/Siemens optimistic. Because according to IBM, X-ray lithography gives them a lead of several months over the competition at the present moment. In chip engineering, that is half of an eternity.

The Japanese, however, are not upset by this. "No need for X-ray lithography for the 64-megabit chip," is the view of the world's leading semiconductor manufacturer, NEC. As a run-up to the beginning of production planned for the end of 1993, the Japanese electronics company had tested various production techniques. At

the end of March, NEC completed the evaluation phase with the conclusion that structures of 0.35 micrometers can definitely be produced with conventional light lithography (I-line steppers) if the corresponding equipment is improved. By using the known technology, NEC hopes to achieve considerable savings in investments for a 64-megabit factory.

Money in particular plays a major role in the 64-megabit project. Four to five billion German marks is ZVEI chief Wessing's estimate of the advance money (research costs and investments) necessary for production of the latest generation of memory chips. Thus, the two big companies Siemens and IBM are looking for an additional well-heeled partner. They require 1 billion German marks [DM] as the dowry from an industrial partner, or else a corresponding government grant.

At present, Federal Minister for Research & Technology Riesenhuber sees no way that he can invest more money in the megachip project. Still, not all politicians are rejecting the desire of IBM and Siemens for state funding for production in Germany. Thus, the spokesman and chairman of the CDU/CSU [Christian Democratic Union/Christian Social Union] Bundestag caucus for research policy, Christian Lenzer and Erich Maass, are afraid that without state aid, the competitiveness of the European industry is in jeopardy. They say that it must be ensured that at least one factory emerges for the new generation of memory chips—even if profitable memory production is not possible in Europe in the medium term.

At the beginning of the year, Siemens and IBM invited the Netherlands' Philips and France's SGS-Thomson to join them, but neither one was particularly interested in getting into a costly race with the Japanese. Apparently, though, the IBM/Siemens team has also received an offer from Singapore, prompted by the government there. A possible potent partner is already active there with Texas Instruments.

But even if IBM and Siemens manage to scare up a well-heeled partner from industry or state financing sources, the dependence on the Japanese will continue. Because in order to build superchips, one needs ultrapure chemicals, and at present only Far Eastern alchemist kitchens are able to stir these up.

COMPUTERS

Hungary: Albacomp CEO on Company Strategies, Successes, Plans

92WS0486B Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 31 Mar 92 pp 13, 14

[Interview with Janos Minarovits, president of Albacomp, by Sandor Mester: "I Am Pro-Manufacturing"]

[Text] The Albacomp Computer Technology Small Cooperative, founded in 1985 with headquarters in Szekesfehervar, is one of the most healthy-appearing undertakings of the Hungarian computer industry. It has expanded its assets, 220,000 forints at the time it was founded, to 800 million. The great majority of the 17 private individuals who started the undertaking had worked earlier at Videoton.

Janos Minarovits, president of Albacomp, gave our paper an interview. It will appear from the conversation below how he sees the status of our profession and how he imagines the future of his firm.

[Mester] There are those who expect the Hungarian computer market to grow in 1992, but there are also those who expect a decline.

[Minarovits] I am not counting on a great growth; the market will stabilize this year. Prices decreased to a significant degree in the past two years, primarily in the category of nameless computers. Today one can make a bigger profit with anything else other than computers. An awful lot of small firms have been formed; the profession is calling them "single container" undertakings. They import something and pass it on and only then realize that this gives a minimal profit—they have ruined the market. Some users still look for cheap computers. They do not realize that the service that goes with it is an important part of the product; one has to be able to find the vendor if the computer dies after six months. We find that the more demanding users are interested in better products. A bank or an insurance company is less able to risk buying nameless computers, among other things because it might hurt the prestige of the firm. This is why we have started selling the products of Twinhead and Intel.

[Mester] The local representatives of the world's big computer enterprises, the Hungarian IBM, DEC, ICL and Bull, are participating ever more actively in the market struggle.

[Minarovits] We are striving for cooperation. There is talk that we will be partners of Bull or IBM, and now we are preparing a contract with DEC as well. Which of the three we will finally come to an agreement with I do not know. There are certain areas which rule out our having a link with several firms. I do not consider it probable that we could have good relations simultaneously with IBM, ICL, DEC and Bull and maybe HP.

[Mester] Are you thinking of commercial contracts?

[Minarovits] We are talking about distributor, dealer or representative level rights. It is my experience that these four big firms—and we too—are suffering a sort of disorientation, they don't really know to what extent they can intervene directly in the market processes. They have to decide how to maintain contact with the customers, through a network of wholesalers and retailers or directly. It will take years to develop clear relationships.

[Mester] The great majority of the inventory in our country is PC. What changes do you expect?

[Minarovits] Not only is it unhealthy that the PCs predominate but also that DEC rules alone in the mini and mega-mini category. In the surrounding countries, for example, HP is very strong; but there are no Hungarian applications. These machines can be imported only if there are domestic applications for them. I am sure that the offerings of the market will expand.

[Mester] Where is Albacomp looking for a solution?

[Minarovits] The PC still plays the chief role in our trade. We carry the nameless computers too; we are trying to give tolerable quality at a good price. In the medium category we are offering the Taiwan Twinhead; and the Intel product family represents the peak quality. We will be partners with either HP or Sun in the area of RISC-based machines. For the time being we are trying Sun. And the agreement to be signed with DEC belongs to this theme as well.

[Mester] According to my information from competitors Albacomp is one of the biggest PC vendors in Hungary.

[Minarovits] We have no precise data; I estimate that we sold more than 10,000 machines last year.

[Mester] Then Albacomp is really one of the first.

[Minarovits] We are in first or second place, somewhere among the two.

[Mester] The PC trade of the Hungarian computer firms playing a leading role thus far fell last year, with perhaps one exception.

[Minarovits] Everyone turned in the direction of least resistance. One way to save business was office technology, where the task is to sell finished products, and where there is less probability of equipment failing. One can live on the PC market only if the vendor buys directly, which involves great financing burdens. They do not usually sell on credit in the Far East. One wins this struggle only if he invests gigantic sums; there may be those who cannot do so.

[Mester] The other breakthrough point is telecommunications.

[Minarovits] One can make mistakes there too. Many regard this business as a commercial activity. They import an exchange and think that they do not have to

understand it, they only have to sell it, and after it is wired up they can forget the customer. We chose a different road. We put a family of subexchanges on the market after three years of developmental work; they are at the Panasonic level, the price is good, and their services are outstanding. One can be more successful this way than if he just acts as a trader.

[Mester] Albacomp works as an enterprise group. You began decentralization earlier than the other Hungarian undertakings.

[Minarovits] Our founding members began to build up Albacomp with a past of more than 10 years at Videoton. We hated the idea of becoming a large enterprise, because we knew very well the disadvantages that went with that. For example, we do not start regional representation by opening our own office. Rather, we seek out understanding partners and found a joint company with them, not even with the Albacomp name. We already have 25 such companies working throughout the country. I think that other firms too are increasingly choosing this solution.

[Mester] Albacomp has expanded its sphere of activity by selling software as well.

[Minarovits] We do not deal with the development of programs. We are system integrators for Novell, that is we have a distributor link with this firm through Walton. We work as a system house for Lotus, and again thanks to Walton we got wholesaler status. We sell the Retix correspondence program, which has very good network capabilities; and we represent Cabletron. It appears that we have come to an agreement with the SCO; we will be the fourth master reseller in Hungary.

[Mester] What sort of larger systems have you sold in the recent past?

[Minarovits] In September and October of last year we delivered 400 computers to the Hungarian Telecommunications Enterprise [Matav], and we hope to get an order of similar size from Matav this year. Many of our computers work in the offices of the Postabank.

[Mester] We do not hear about Albacomp when orders can be obtained by bids.

[Minarovits] So far we have rarely tried making bids, now we will do so more often. I am not convinced that the judging of bids is always objective. Most recently we entered a competition at the Ministry of Internal Affairs. We probably did not win because we have heard nothing about it. There are cases where one has to deliver a red computer with a green network cord, but generally that is revealed only after the fact. Preparing the material for a bid takes a lot of work, and it turns out that they had decided on the vendor when they wrote the request for proposals.

[Mester] Szekesfehervar is one of the crisis zones of the country. Albacomp is one of the few Fehervar firms which is growing.

[Minarovits] We were never stronger in this area, we do most of our business elsewhere. From the viewpoint of our firm the crisis has advantages, there is an oversupply on the labor market. If we need men we can select from among the best. As citizens of Fehervar this state of affairs is intolerable. The town is dead, I do not know when we will get out of this. Not only Videonton is in crisis, the other big firms are too.

[Mester] If you are looking for workers, certainly you select first from among those laid off by Videoton.

[Minarovits] Videoton practically closed down its computer branch; the labor force supply is huge. We have developmental plans which would involve the employment of 300 people.

[Mester] What happens with Videoton is not a matter of indifference for the Hungarian informatics industry—nor of course for the town and its zone of attraction. Will the new management be able to overcome the difficulties?

[Minarovits] In its form the enterprise has no chance of surviving. Probably it can give work to several thousand people—I do not know how profitably. I am not too optimistic.

[Mester] What future does Albacomp plan for itself?

[Minarovits] One developmental trend is manufacturing in the classical sense. According to our plans we will perform this activity with a Hungarian-Far Eastern mixed enterprise, separate from Albacomp. We will manufacture computer subassemblies. We have bought a site, reconstruction of which has begun. We must keep the commercial activity separate from the manufacturing. Our foreign partners do not understand this; we sell to the final users, we sell certain products as wholesaler, and then we manufacture too. I myself am pro-manufacturing—creating value, producing the added value, takes place here.

[Mester] Your firm is increasing its market share in neighboring countries too.

[Minarovits] We have strengthened our market positions in Czech-Slovakia and Romania, and we have already sold computers in the area of the former Yugoslavia, in cooperation with a foreign firm. The Czech-Slovak market is the most cultured, and we were among the first of Hungarian firms here. Our sales in Romania are increasing too, for the time being via contacts which are not strong enough. The majority would like to achieve success in Croatia and Slovenia; in a curious way we are testing things in Serbia. We sell 30 percent of the imported products on these markets jointly with another firm.

[Mester] Do you have financial problems in these countries?

[Minarovits] We soon learned that one cannot deliver to Romania on credit. We do not have this sort of difficulty in Czech-Slovakia.

[Mester] And in Hungary?

[Minarovits] This is simply Wild West. Nobody wants to pay, you have to beat the money out of everybody. Whom we select as partner makes a difference. There are those who take the goods, sell them, and then go bankrupt. There will be no change as long as there is no honest bankruptcy law. In Austria, after a single such case, they take the entrepreneur off to rest—in prison. In America, after a second case, they withdraw the business permit forever. In Hungary one can carry out 20 such deals, one can even play against the state. One can fail to pay taxes and nothing happens. Compared to its trade of 2 billion a year the amounts owed to Albacomp which prove uncollectable are negligible, but even this is extraordinarily nervewracking. The situation was different three to four years ago. One can find among our debtors, for example, the Hungarian Social Democrat Party, Radius Hungaricus, or Mr. Morvai, whose firm, Megamorv, we have now taken to court. There are plenty of swindlers in this country. One can expect a change only if the state takes care to see that one does not go unpunished for not paying taxes, cheating on taxes, while smilingly telling stories around the land. We must see to it that one cannot declare fraudulent bankruptcy without having problems. In the meantime the honest players on the market must band together to eliminate from their ranks the dishonest entrepreneurs.

[Mester] At what rate is Albacomp growing?

[Minarovits] According to my calculations we have achieved 20 percent net value growth per year; actually it is substantially greater than this because the prices of computers have fallen in the past three years. In this time the number of computers sold by us increased three to four times, and our sales receipts hardly increased. Growth faster than this is not likely in the present economic situation. It is not decided yet which year—1991, 1992 or maybe next year—brought or will bring the nadir. We do not know what consequences will accompany, for example, the ruination of agriculture, which will take place this year. Things may get worse.

[Mester] What percentage of your colleagues are business and what percentage are technical?

[Minarovits] Up to the end of 1991 three or four of us dealt directly with sales, this includes me. The first of January we took on four colleagues who will do commercial work as product managers.

[Mester] The Ifabo is approaching. Will there be big news?

[Minarovits] There will be no great sensations. We participate in as few exhibits as possible, the organizers themselves help us in this—let us think only of the Banktech and microCAD-SYSTEM exhibits, which were held at the same time. I think we need two big exhibits. It is good that computer technology was divorced from the spring BNV [Budapest International Fair], the Compfair is a good thing. But I doubt that we need more exhibits. There is not so much profit in this business, and each such fair does not bring in enough to justify participating in different programs every month. We are resigned to the fact that we have to be there at the bigger ones. What I say may be surprising—these fairs hurt business more than they help it. I am against fairs. The market comes to a halt before the Ifabo or the Compfair, they are waiting for miracles, and afterwards it does not start up again as it should. We found that following the Ifabo last year the market returned to itself only in September.

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