ISRAEL HIGH-TECH REPORT

A MONTHLY REPORT COVERING NEWS AND INVESTMENT OPPORTUNITIES

JOSEPH MORGENSTERN, EDITOR

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EDITORIAL

RESTRUCTURING OF SCIENCE-BASED INDUSTRIES: FOR SOME THE ROAD IS LESS BUMPY THAN FOR OTHERS

Outside of Israel, scant attention, if any, is being paid to the current restructuring of this country's industries -- which are moving away from governmental assistance and changing their traditional manner of doing business.

The 1967 French embargo on exports of technological materiel to Israel led to a realization that this country should develop industries whose products would be based on local research and development, and that those industries must be capable of supplying material critical to the nation's defense. Government support took the form of research and development grants awarded by the Office of the Chief Scientist of the Ministry of Industry and Trade.

The aim was to initiate and nurture the development of industries, whose products would be the result of local R&D and would not only supply internal needs, but could be exported. For many years this has worked well. Currently, more than half of Israel's industrial exports of over $7 billion in 1987 are the result of local development. Five years ago, the budget of the Office of the Chief Scientist was $35 million, and there were many more applications than funds available. This year, the Chief Scientist's budget is $100 million; but it appears that, at the end of the year, he will have an unallocated balance. This development is so unusual that it is worth analyzing.

A few years ago, no one was prepared to predict that in Israel, where science and technology are part of the national way of life, available research and development funds would not be fully utilized. Yet this is happening while industrial production and exports are rising at a high rate. The electronics industry alone, in 1987, had sales of $2.25 billion. Sales were 10% higher than in 1986 and the 1987 exports were 60% of the total.

Is it possible that Israeli science-based industries are learning to stand more and more on their own feet and are moving away from governmental assistance? The emerging picture would indicate that this is indeed the case. The under-utilization of the funds of the Office of the Chief Scientist is just one example. Another is the industrialists' determination to have the Minister of Finance remove fiscal and monetary restraints. This is happening right now in the pre-election period, when Israeli politicians are more sensitive than ever to requests from the electorate. Industrialists are critical of the government-imposed freeze on the exchange rate. At its current level of NIS.1.65 to $1, the exchange rate is exactly where it was a year and a half ago. However, in that period of time, Israel's inflation rate has been more than

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Circulation Offices: Israel Publications Inc.47 Byron Place,Scarsdale, N.Y.10583, USA.
Attention: Mr. Robert M. Bruckenthal.
Editorial Offices: Asia House, 4 Weizman Street, Tel Aviv 64239, Israel.
Tel:- 972-3-430817. Tlx: 33511 EISGR IL. Fax:- 972-3-255816.

25%. Companies whose products and systems are sold in dollars -- and as a direct result of the exchange rate freeze -- have had difficulty in creating profits even while exports are growing. The government controlled exchange rate has achieved internal economic stability, but has had a negative effect on dollar export profitability. It is our own view that the rate of exchange should not be artificially controlled.

The Bank of Israel, Israel's central bank, is also being taken to task by industrialists for its policy of maintaining high interest rates. It is of little consolation to science-based industries to hear government and Bank officials explain that their policies must be maintained so as to safeguard overall economic policy. In a rapidly changing economic environment, a premium is placed on management's ability to adjust to conditions. Those that cannot make the adjustments are facing even more dire straits than loss of profits. Bankruptcies and unemployment due to restructuring are the result of economic dislocation. More than a few of these have taken place and undoubtedly others will be announced in the foreseeable future.

As restructuring takes place, industrial survivors of the "great shake-out" of the 1985-88 period are emerging. What characteristics do these companies have in common?

Primarily, they are science-based industries that have the ability to survive changes in world demand for their products as well as internal economic fluctuations. Also, they continue to carry out research and development, production, financing, and marketing -- and make profits. Typically, they are led by top management which has matured and assimilated the experiences from the "boom and bust" environment of the early 1980's. They no longer think of "going it alone". They are ready and do enter into international joint ventures, both in production and marketing. As they strengthen their international ties, the managers are moving away from seeking government assistance. As they do so, they also tend to be more than vociferous in their criticism of the government's role. This is true of the older, more established companies, as well as of the fledgling science-based companies.

The new look in the way Israeli science-based industries operate is already well advanced, with clear prospects for a continuation of the trend. The growth in total sales and exports are positive signs, notwithstanding the problems of the engineer brain drain and unemployment. As with all transitions, the road to restructuring by science-based industries is bumpy but it is well worth following to its destination.

APCO INITIATIVE RESULTS IN ISRAEL-U.S. COLLABORATION

Major Israeli institutes of higher learning, without exception, maintain research and development firms whose main purpose is to commercialize the research of their scientific staff. Typically, these authorities apply for patents, seek sponsors for ongoing research, issue licenses and negotiate rights, and assign patents to those who are willing to pay for them. They try to form joint ventures for the development and production of products originating in their laboratories. To give scientists employed in basic research an incentive, and to stem the brain drain, scientists are offered a percentage of the income earned from these products. Part of the proceeds is returned to the institute to promote research.

Yeda Research and Development Foundation was successful in the formation of the Inter-Yeda Company, together with InterPharm, whose work was based on Prof. Ravel's fundamental research on interferons at the Weizmann Institute of Science. This collaboration will result in sales of interferon in 1988 of about $20 million. Recently, Yeda announced that it had sold its part ownership in Inter-Yeda. The monies received from the sale of the shares will be turned over to the Weizmann Institute to support basic research.

Due to budget constraints in Israel's higher education system, the

authorities have been increasingly urged to accelerate their commercialization activities. The Technion-Israel Institute of Technology has entered into an agreement with APCO Associates, the Washington-based firm affiliated with the prestigious law firm of Arnold & Porter. APCO, headed by Margery Kraus, undertook to find a partner for collaboration so that some of the Technion's medical technology could be developed into a marketable product. Margery Kraus has reported to the Israel High-Tech Report of the formation of a new company, FrantzTech, a joint venture of the Technion and Frantz Medical Development Company. APCO initially set out to validate the Technion's technology and to target a proper partner for a small market survey. FrantzTech is now focusing both on developing technology for medical devices and on manufacturing and selling products derived from the innovative technology.

The first project is related to Nutritional Assessment Gas Analyzer (NAGA), a device that measures a patient's oxygen consumption and carbon dioxide production to determine nourishment needs. After completing R&D, FrantzTech intends to produce NAGA in Israel, and will also market it abroad.

Projected sales are in the order of 7,000 units for a total of just under $50 million.

NEW PRODUCTS

SYSTEM 300 FOR USE IN DYEING TEXTILES

SYSTEM 300 is a new generation of process controllers for continuous textile process and dyeing machines.

The SYSTEM 300 is comprised of ATC-303 process controllers integrated with IBM PC/AT and PS/2 computers. The system exerts control over nearly all continuous textile processes. It is based on distributed control system technology. Microcomputers are situated at machine zones and serve to control production functions. A somewhat different configuration is available for batch dyeing.

The systems are produced by Arel Control (1971) Ltd.

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NEW ROBOT PACKAGES ODD SHAPED ITEMS

The new G.B.I.M. robot was recently introduced in Switzerland at a trade show. It handles and packs unevenly shaped and difficult to handle products, such as fruit and other foodstuffs.

Produced by G.B.I.M. Automation Systems Industry Ltd., the robot consists of a reliable transfer arm, guided by a simple vision and software system. The company has been producing automated assembly systems for many of Israel's industrial sectors. G.B.I.M. and other companies active in automating procedures have been concentrating on providing systems which will mechanize such labor-intensive activities as fruit picking.

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COMPUTER AIDED TOOLING DESIGN SYSTEM UNVEILED BY OPTROTECH

Image 5000 is a new Computer Aided Tooling Design system, recently introduced by Optrotech Ltd. at the Nepcon East '88 exposition in Boston. The system is made up of an engineering workstation and flat bed laser plotters. It is designed specifically for automating the front end engineering functions of a printed circuit board (PCB) plant. The system prepares complete tooling packages for production. It allows for PCB design modification, CNC drill and route machine programming and design verification.

It is built around an Apollo workstation in a UNIX environment. Plotting speed has been enhanced and a 480 inch square image can be plotted in two minutes, which the company reports is twice the speed of other systems.

Optrotech, in its sixth year of operation, is considered a leader in computerized, electro-optical inspection and CAD/CAM systems for automated production of printed circuit boards.

ISRAEL HIGH-TECH SHARES TRADED IN THE USA

	P-E Ratio	Price as of 8/15/88	Change since 7/15/88		Earnings per share 1986/7	1987/8
BIOC OTC						
BIO-TECH GENERAL Biological products for health care	d	3 1/2	- 5/8	3 Mo Mar	d 0.38	d 0.47
ELBTF OTC						
ELBIT COMPUTERS Defense electronics	6	4 7/8	+ 7/8	6 Mo Jun	0.67	0.39
ECILF OTC						
ECI TELECOM LTD. Telecommunication Systems	9	3 3/4	- 1/4	3 Mo Mar	0.01	0.10
ELRNF OTC						
ELRON ELECTRONICS Company investing in high technology	11	2 3/8	- 1/2	6 Mo Jun	d 1.22	d 0.15
ELE NYSE						
ELSCINT Full range medical imaging		1 1/8	n.c.	3 Mo Jun	d 0.18	d 0.02
FBRX OTC						
FIBRONICS INT'L Fiberoptic communications	d	3 3/4	+ 1/4	6 Mo Jun	d 0.08	d 0.09
IPLLF OTC						
INTERPHARM LAB. Biological products for health care		3 1/4	- 1/8	3 Mo Mar	d 0.09	0.02
LAS ASE						
LASER INDUSTRIES Surgical laser systems	d	3 5/8	- 7/8	3 Mo Mar	0.29	d 0.09
OPTHF OTC						
OPTROTECH Electro-optical systems for PCB	11	3 3/8	- 3/8	3 Mo Mar	0.09	0.09
SCIXF OTC						
SCITEX Computer graphics	5	5 3/8	-1	6 Mo Jun	d 0.68	0.49
IISLF OTC						
I.I.S. Computer peripheral equipment	5	4 1/2	+ 3/4	6 Mo Jun	0.37	0.46
SPIXF OTC						
S.P.I SUSPENSION - PARTS INDUSTRIES Military components	9	1 5/8	- 1/2	3 Mo Mar	0.07	0.04

d = deficit

FIBRONICS REPORTS A QUARTERLY PROFIT

Fibronics International Inc. (NASDAQ/NMS:FBRX), in the quarter ending June 30, 1988, reported sales of $10.4 million and net earnings of $353,000 (see table p.4).

At the end of May, chairman Morris Weinberg indicated that Fibronics was initiating a series of significant cost reducing measures, limiting new cash commitments, and obtaining additional financing. He also said that management had taken some tough action to reduce costs worldwide and improve U.S. sales. Senior management has taken a 10% salary cut and the company's workforce has been reduced by 81 positions. The recent improved figures are a result of higher sales, a 20% increase over the same period last year, and modestly improved margin levels. The market is currently capitalizing Fibronics at just over $23 million.

Fibronics designs, manufactures, sells, installs, and services fiberoptic and other high-bandwidth information transfer and distribution systems. Fibronics provides total systems capability for integrated, on-premises networks.

ARYT'S AMERICAN PURCHASE

Aryt Optronics Industries Ltd's (NASDAQ:ARYUF) American subsidiary, which it acquired in the fourth quarter of 1987 for about $200,000, has an accumulated backlog of about $2 million. The company is producing lenses for F-15 simulators. An important customer for this product is Hughes Aircraft.

Simulation in the aerospace industry is a fast growing sector. Moreover, Aryt has developed the capability of producing a spherical glass optical element using computerized diamond turning techniques. This allows for efficiencies and cost effectiveness heretofore not possible, according to Dan Kay, Aryt's chairman of the management committee.

Aryt still has $6 million in its corporate coffers. At the present time, Aryt is seeking but has not pinpointed any new suitable acquisition to interface its activities.

Aryt specializes in the production of diamond machine optical elements. It supplies optical lense elements and sub-assemblies for electro-optical systems, mostly to U.S. prime defense contractors. The company is in a highly specialized area of activity and the policies of its very conservative management have resulted in highly controlled growth.

ANOTHER STEP TOWARDS ORBIT

An agreement was signed between GSS and Israel Aircraft Industries relating to a location for launching the Israeli satellite Amos. The signing of the agreement marked another step forward towards placing Israel's first satellite into orbit. However, it is not clear sailing yet. In order for the program to clear the next hurdle by August 1989, a commitment will have to be put into effect by users, mostly the Government of the State of Israel, to assure an orderly progression of the project.

The General Satellite Corporation is a partner in the development of Amos. Another firm, the Israel General Satellite Service Co. Ltd., which is a joint venture established by Israel and American businessmen, and the American-based International Satellite Networks firm will in due course become one of many users of Israel's telecommunications satellite.

	8/15/88	7/15/88
DJIA	2037.52	2114.51
S&P 500	262.55	270.23
NYSE INDUSTRIALS	178.88	184.91
ASE MARKET VALUE	296.48	308.11
NASDAQ INDUSTR'LS	385.40	410.75
ISRAEL HIGH-TECH REPORT INDEX*	85.65	86.91

*ISRAEL HIGH-TECH REPORT INDEX is a weighted index made up of the shares of 10 leading high-tech companies. Base=100 as of 9/30/84

SHRINKING PROFIT MARGINS BLAMED FOR THE LOWEST RATE OF GROWTH OF EXPORTS TO THE U.S. IN SIX YEARS

Israeli exports worldwide, except to the U.S., grew by 37% in the first six months of 1988. During the same period, exports to the U.S. grew by only 9% while imports from the U.S. advanced by 15%. Israeli exports to the U.S., in that period, totalled $1.32 billion, while imports totalled $1.06 million. The positive balance of trade of only $253 million has been viewed with concern in Israel as export growth increased by the smallest rate in nearly six years.

These details appeared in a study carried out on behalf of the American-Israel Chamber of Commerce and Industry by the Ministry of Industry and Trade. Cause for concern was raised by statistics which indicated that "most of the growth in the exports to the U.S. in this period resulted from the raising of prices, rather than from an increase in the quantity of exports".

Electronics were among the few sectors that showed a real export growth in that period.

WEIGHING CHICKENS IS A WEIGHTY MATTER

One reason for wanting to know the exact weight of a chicken is so that one can calculate the precise quantity of feed required. Modern commercial poultry farms require speedy and accurate procedures for obtaining the body weight of chickens on an on-line, daily basis.

Israeli scientists and technicians have developed automatic electronic scales. One of the most advanced of these is produced by the "Shekel" company.

The "Shekel" system is based on units of 16 or more weighing platforms which are placed randomly on the floor of the poultry house. The birds step onto the platforms and the weighing sensor transfers the value of the momentary load into the computerized weight indicator. The sophisticated equipment calculates the exact body weight of each bird on the platform and differentiates between the weight of new birds and that of those which stepped on the platform previously. The exact weight of each bird enters statistical processing, performed also by the same computerized indicator.

A highly sophisticated method for individual precision weighing has been developed by Mr. Eliahu Wax of the Volcani Center in Bet Dagan. It is an automated weighing system including a movable cage, a plastic tube fixed to the weighing platform of the electronic balance, a microprocessor and an electronic control data store.

The new system is extremely efficient due to its high through-put. 450-500 chickens can be accurately weighed in an hour, as compared with only 100-120 chickens when weighed by conventional systems. The automatic precision random weighing system is best suited for commercial flocks. For breeding farms and research institutes, individual weighing is the preferred way to obtain precise data. Conventional systems are generally precise but they are labor intensive and time-consuming when large numbers of chickens are involved.

TECHNION BUDGET OF $102 MILLION

A record number of 300 delegates and observers from 15 countries attended the 1988 International Board of Governors meeting of the Technion-Israel Institute of Technology. A proposed budget of $102.3 million was approved for 1988/89. Income anticipated at $98.2 million would result in a deficit of $4.1 million.

An increase in the current level of government participation in covering the cost of higher education is expected to begin in 1989. The Board recommended that special outreach programs should begin to increase the number of women engineers. Also the Technion will be seeking an increased interrelationship between itself and the Israeli high-tech industries.

INFRARED DETECTORS: AN ISRAELI "LEADING EDGE" TECHNOLOGY - MANY DEFENSE APPLICATIONS AND PROSPECTS FOR VALUABLE COMMERCIAL SPINOFFS

Infrared (IR) detectors are not new. The Israel Air Force, and the U.S. Air Force, both employ such detectors to assist pilots in locating and destroying targets at night -- even under the poorest of weather conditions, and while flying at extremely low altitudes to avoid detection by radar. They are also used in helicopters, both on rescue and reconnaissance attacking missions. Armies employ IR detectors to identify tanks and other vehicles. Advanced IR night vision systems produce "daylike" pictures so clear that they can identify all types of vehicles. Fighter planes or other tactical carriers can be pinpointed. IR systems for day vision allow detection and tracking of commercial aircraft at distances of more than 60 miles. Existing capabilities are leading to the development of automatic target recognition (ATR). Artificial intelligence is used in combination with an IR system, allowing detection of an aircraft as well as its identification by type. IR detectors are considered important in early warning against missiles and they can also trace the missile.

In Israel, the development and production of IR detectors is in an advanced stage. The United States Department of Defense has a program, valued at no less than $500 million, aimed at developing and acquiring new IR detectors. Israel could be a valued supplier and part of the American effort. IR systems are of particular interest to the military sector because they emit no signals of their own. Radar- like systems are becoming less acceptable as developments in electronic countermeasure and radiation seeking missiles move ahead.

IR TECHNOLOGY

All objects on the earth and in orbit around it emit strong IR signals, which lend themselves to being picked up by detectors. These detectors are designed to respond to one of the three major bands of IR radiation.
SHORT WAVE (1-3 microns)
MEDIUM WAVE (3-5 microns)
LONG WAVE (8 - 14 microns)
Both the medium and long wave bands are the most common target application area for detectors. Radiation in the 5-8 microns band is absorbed by water vapor in the atmosphere.

Objects emit radiation of varying wavelengths. The wavelength is related to the object's temperature. Short and medium wave IR detectors are useful in identifying targets that appear "hot" against a cold background. One example would be an airplane whose engine heat stands out against the cold sky. By contrast, the detection of a "cool" missile in space against the warmer background of the earth below, requires a long wave detector. Crucial to any IR detection system is the individual sensor. It is a square cell, on the order of a thousandth of an inch on each side, which converts the energy of infrared light into electrical signals. A photolithographically produced chip containing between

hundreds and thousands of such cells, called a focal plane array (FPA), provides signals that can subsequently be processed into television-like images.

To achieve optimal detection capabilities, one must take into account a number of requirements, some of which conflict. The higher the results required, the smaller the individual sensors should be. To heighten sensitivity, the sensors should be densely placed and the number of detector elements increased so as to pick up comparatively weak IR signals. Noise caused by sensors themselves increases with rising temperatures. The minimum practical temperature at which the systems can operate is 77°K. To achieve the low temperatures, liquid nitrogen can be employed, as well as Sterling coolers. Sensors in the system are sealed in a Dewar flask containing that element. Putting more sensors on a chip enhances the qualities of detectors. The use of new materials provides the sensors with a greater versatility in detection.

An important producer of IR detectors is the Jerusalem-based Semi Conductor Devices (SCD) company, a Tadiran and Rafael partnership and a leader in silicon photodetector products and technology. SCD has achieved leading edge technology and excellence in Mercury Cadmium Telluride (MCT) sensors.These sensors are especially desirable because they operate on all three major IR bands. In long wave bands this is the only material which us usable. They are used primarily in thermal imaging systems.

SCD's InSb detectors are used in systems seeking out air-to-air missiles and in thermal imaging systems. The company's silicon detectors are used in laser designators, laser rangefinders and smart munitions. Since SCD develops and produces solely detectors, it cannot always identify the systems in which the products are used. However, it is likely that these detectors are used by some of Israel's major defense systems' manufacturers. Among the military applications is Rafael Armament Development Authority's use of this technology in the Python 3, its infrared air-to-air missile.

A typical application is in conjunction with El-Op's computerized tank fire control systems. The El-Op Matador Tank Fire Control system transforms an "ancient" tank into a modern weapon. The system uses day and night sights for gunner and commander, laser range finding, a ballistic computer and various environmental sensors to achieve first round hit capabilities.

Elbit Computers Ltd., at its American based subsidiary, has developed thermal imaging systems which provide real time images for night viewing and can detect targets at night at distances of up to six miles.

Israel's advanced standing in the field of IR detectors and military systems employing this technology was developed in direct response to the country's perceived security needs. This will undoubtedly continue to be the driving force behind further developments in detector technology related to new systems utilizing the IR detectors.

Attention is now being drawn to the prospect of applying this leading edge technology to non-military applications. The commercial potential is much greater than in the military market. It is not far fetched to think that, in the foreseeable future, the dentist may be using an IR detector as a replacement for the X-Ray, with its harmful side effects; and that the dairy farmer may be examining his cows for bovine mastitis with a small and portable IR detector containing unit. At all levels, whether military or commercial, the stakes for those who excell are great.