

ISRAEL HIGH-TECH REPORT

A MONTHLY REPORT COVERING NEWS AND INVESTMENT OPPORTUNITIES

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December 1988 Vol.IV. Issue No. 12.

ISSN 0334-5307

EDITORIAL

46=500: THE R&D MONEY GAME FORMULA

Israel ranks close to the top of the list of modern industrial nations that have excelled in developing their own products and then producing them for export. A former Chief Scientist of the Ministry of Trade and Commerce has declared that more than 50% of Israel's industrial exports are developed locally and the trend is upwards.

It is always interesting to analyze what really powers Israel's industrial production and its growing exports. In two areas, defense and high-tech, it is very clear that research and development efforts continue to be the driving factors. The executive director of BIRD, the Israel-U.S. Binational Industrial Research and Development Foundation, has presented some of the most convincing figures. Over the past eight years, BIRD has sponsored \$46 million in projects to promote and support joint Israel-United States industrial research and development activities of mutual interest to both countries. Dr. Mlavsky has seen the \$46 million lead to \$500 million worth of products. The Israeli companies carry out the research and development effort, while the American partner provides the marketing. It would be a very safe assumption that the \$500 million worth of products developed under BIRD R&D programs have been nearly totally converted into exports.

The fact that one dollar of R&D money can grow into almost eleven dollars of exports provides an overriding rationale for the acceleration of R&D spending. But this is easier said than done. The director general of the Ministry of Trade and Commerce

quite properly credits BIRD's achievements as being directly connected with the marketing support provided by the American firms, who are partners in the BIRD binational company partnerships. The director-general has uncovered a basic truth which stipulates that it is market-driven research that provides the best results for the money invested. Research based on conceptual problem solving, or which tends to be so highly innovative that it loses touch with the realities of the marketplace, has less chance of succeeding. It is the market which serves as the ultimate judge of what gets produced and provides jobs or what is destined for the graveyard of unused industrial R&D efforts.

Using the BIRD model -- while conceding that it cannot serve as a completely foolproof basis for projection of Israel's future exports -- one can predict that the nearly \$40 million worth of R&D funds being provided in the current year by the Chief Scientist of the Ministry will, somewhere upstream, mean more than \$400 million of exportable products.

So much for non-defense industrial research and development. Much more funding is available for defense products than for non-military

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Subscription: 1 year \$125.-. Bulk copy and reprint information available on request
Israel High-Tech Report: Copyright 1987 Israel Publications Inc.
Circulation Offices: Israel Publications Inc. 47 Byron Place, Scarsdale, N.Y. 10583, USA.
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purposes. Here, however, it is much more difficult to quantify, due to the traditional reticence of the defense establishments to publish meaningful facts and figures. This makes an assessment of the leveraging of R&D, in terms of resulting exportable products, quite difficult. Yet one can safely assume that defense R&D focuses itself first and foremost on the needs of the Israeli defense establishment. Exports only begin when the products created for Israel's defense are proven to be applicable to the military needs of other nations. Only then can defense R&D lead to exportable items. Individual case analysis of some leading edge, state-of-the-art products, such as infrared detectors for use in missile and space applications, reveals that R&D costs can be four times the value of the ultimately usable final product. In the case of detectors, it also becomes clear that the length of time for defense-oriented R&D products to be converted into export sales is much greater than for non-defense items.

Leading American companies continue to view Israeli R&D efforts as a source of profits. The areas of semiconductors and of "smart" software appear to be among the most vibrant fields of activity and offer the greatest commercial opportunities for trade and joint-ventures.

MAJOR DEVELOPMENTS AT INSTITUTES OF HIGHER LEARNING

INCIDENCE OF AIDS IN ISRAEL CURRENTLY MANAGEABLE

Hebrew University of Jerusalem Aids clinic head, Dr. Shlomo Maavan, estimates that the total number of Aids cases in Israel would not exceed 10 or 11 in 1988. In 1987, 13 cases of Aids were reported while in 1986, 15 new cases came to the attention of Israel's health authorities. So far, 63 cases of Aids have been reported, or 12 cases per million population. Worldwide 100,000 cases have been reported so far. In the United States, the incidence of Aids is 240

per million population. Dr. Maavan suggests that the low level of Aids incidence in Israel is the result of greater caution being exercised by the high risk elements of the population -- homosexuals and drug addicts.

In recent years, all Israeli blood donations have been checked for Aids antibodies prior to the blood being approved for use.

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MERCURY POISON VICTIMS TREATED BY HEMODIALYSIS

Toxic metal poisoning (for example, from lead, mercury and cadmium) has not emerged as a serious problem in Israel. Nevertheless, Israeli doctors see cases of poisoning among rural and nomadic populations who continue to mill wheat for flour with grinding devices containing lead. Mercury poisoning may occur as a result of eating tainted wheat grains not intended for human consumption. In the 1960's, hundreds of people in Japan were poisoned after consuming fish with high mercury levels.

Technion-Israel Institute of Technology Professor Samuel Yanai and his associates have developed a method of removing toxic metals from the blood using hemodialysis. In this method, which takes only three to five hours, medication is administered to the blood of the poison victim as it passes through the dialysis machine. The purified blood is then returned to the patient's body, free of medication and the toxic metal substances. The procedure has received the approval of the Ministry of Health.

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WEIZMANN INSTITUTE PROF. MICHAEL SELA DELIVERS KEYNOTE ADDRESS IN BEIJING

Prof. Michael Sela, former president of the Weizmann Institute of Science, and an internationally recognized immunologist, recently delivered the keynote address at the General Assembly of the International Council of Scientific Unions in Beijing, China. In response, Dr. Zhou Guangzhao, president of the Chinese

Academy of Science, stated that "we are immensely interested in closer ties with Israeli scientists."

Noteworthy was the interview with Prof. Sela which appeared in the People's Daily, an official Chinese newspaper.

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NEW NATIONAL INSTITUTE FOR BUILDING RESEARCH

The Ministry of Construction and Housing and the Technion-Israel Institute of Technology have created a new National Institute for Building Research, devoted to research and testing of innovative building structures and materials. The new institute is an expansion of the existing Building Research Station established at the Technion more than 35 years ago.

The joint venture will ensure substantial funding from the Ministry and a major expansion of research projects and personnel. Currently, the Building Research Station, headed by Prof. Abraham Warszawski of the Technion's Faculty of Civil Engineering, employs 125 researchers, technicians and supporting staff.

The National Institute for Building Research will research such topics as prefabrication technology, the repair of building failures, building automation, computer-aided design, the use of solar energy, ventilation problems and urban climatology, acoustics and noise insulation in residential areas, and the interaction between buildings and users.

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NEW APPOINTMENTS

PROF. HAIM HARARI ELECTED 8TH PRESIDENT OF WEIZMANN INSTITUTE

Prof. Haim Harari, 48, Israeli born theoretical physicist, has been elected the eighth president of the Weizmann Institute of Science. Prof. Harari succeeds Prof. Aryeh Dvoretzky who has served as president for the past three years.

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PROF. ARNON APPOINTED VICE PRESIDENT OF WEIZMANN INSTITUTE

Prof. Ruth Arnon, a distinguished immunologist and Dean of Biology at the Weizmann Institute of Science, was appointed Academic Vice President of the Institute.

Prof. Arnon, a sabra, has been at the Weizmann Institute since 1960. Her many research achievements include the development, together with Dr. Dvora Teitelbaum and Prof. Michael Sela, of COP 1, an experimental compound that has proved effective against some forms of multiple sclerosis. Prof. Arnon has also made significant contributions to the field of cancer research and to the study of parasitic diseases, scourge of the Third World. She coordinates Institute efforts in the latter field in her capacity as head of its MacArthur Center for Molecular Biology of Tropical Diseases.

MASSIVE SOLAR ENERGY CENTER DEDICATED

Israel and the Weizmann Institute have moved to the forefront of international solar energy research with the opening of the Canadian Institute for the Energies and Applied Research. According to Prof. Israel Dostrovsky, the center is a pilot plant for the world as a whole.

The new 3000 kilowatt facility consists of a field of 64 mirrors (each measuring seven by eight meters) which concentrate the sun's radiation onto various focal points in a 54-meter-high solar tower. The motor-driven mirrors (known as heliostats), mounted on two axes, track the sun's movements by means of a computer which calculates the sun's position. The facility is intended to enable scientists to explore other more revolutionary and far-reaching uses of solar energy. Among these; a solar-powered laser to trigger photochemical reactions for the production of fuels and a "chemical heat pipe" which, if successful, could collect the vast amount of solar energy available in desert areas and transport it, in chemical form, to distant industrial areas.

ISRAEL HIGH-TECH SHARES TRADED IN THE USA

	P-E Ratio	Price as of 11/14/88	Change since 10/14/88		Earnings per share	
					1986/7	1987/8
ESPC OTC BIO-TECH GENERAL Biological products for health care	d	2 1/4	- 3/4	9 Mo Sep	d 0.80	d 1.08
ELBIT OTC ELBIT COMPUTERS Defense electronics	6	6 1/4	+1 3/8	9 Mo Sep	0.78	0.58
ECILF OTC ECI TELECOM LTD. Telecommunication Systems	9	4 1/4	+ 7/8	9 Mo Sep	0.10	0.32
ELRON OTC ELRON ELECTRONICS Company investing in high technology	11	3 7/8	+ 7/8	9 Mo Sep	d 1.41	d 0.41
ELSCINT NYSE Full range medical imaging		1 1/4	+ 1/8	9 Mo Sep	1.23	d 0.14
FIBRONICS OTC FIBRONICS INT'L Fiberoptic communications	d	3 1/2	- 1/8	9 Mo Sep	d 0.14	0.03
INTERPHARM OTC INTERPHARM LAB. Biological products for health care		3	+ 1/2	9 Mo Sep	d 0.34	0.05
LASER ASE LASER INDUSTRIES Surgical laser systems	d	4	+ 1/2	6 Mo Jun	0.32	d 0.47
OPTROTECH OTC OPTROTECH Electro-optical systems for PCB	11	2 5/8	+ 5/8	9 Mo Sep	0.39	0.39
SCITEX OTC SCITEX Computer graphics	5	6 1/8	+ 1/8	9 Mo Sep	d 1.63	0.86
I.I.S. OTC I.I.S. Computer peripheral equipment	5	4 3/4	- 1/8	6 Mo Jun	0.37	0.46
S.P.I OTC S.P.I SUSPENSION - PARTS INDUSTRIES Military components	9	1	+ 3/8	6 Mo Jun	0.08	d 0.08

d = deficit

THIRD QUARTER RESULTS FROM ISRAELI COMPANIES ON WALL STREET

Optrotech Ltd. (NASDAQ/NMS;OPTKF) announced results which were given a strong boost from its new Image 500 automated artwork generation system. Optrotech's new options for its top line Vision 206 automated optical inspection system started to be shipped in the third quarter. As a result, the company's sales of \$15.5 million gave an operating income of \$1.4 million and a net after tax income of \$981,500. The after tax profits were lower than the growth in operating income on a percentage basis, due to higher interest expense and increased tax provisions.

The company's backlog and continuous demand for its products could put annual sales for 1988 at the higher end of projections and exceed \$57 million and perhaps reach as high as \$60 million. Earnings per share, for the year 1988, may be at \$0.57. (for recent price, see page 4 table).

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Fibronics International Inc. (NASDAQ/NMS:FBRX), for the first time in more than a year, has had two consecutive quarters of profits. Not only has Fibronic's business improved but personnel changes and a slimming down process is directly affecting the net earnings which, after nine months in calendar 1988, were \$198,000. In the comparable nine month period in 1987, Fibronics recorded a loss of \$850,000.

If the fourth quarter results do no better than match the September quarter, Fibronics will show an earnings per share for 1988 of \$0.15.

BIOTECHNOLOGY GENERAL POISED TO SELL SHARES

BioTechnology General Corp. (BTGC:OTC) has seen its shares battered, along with those of other biotechnology issues, in the last quarter. BTGC's cash flow from royalty and drug sales alone is incapable of supporting the development expenses of its multi-

product project. It is known that, for some time now, the company has been negotiating the introduction of a partner. Rumors, which could not be confirmed, are rife that a major Israeli enterprise would like to purchase one-third control of BTGC. If that is the case, the company's shares could rise rapidly. This could come as a result of the investment into BTGC being carried out at a price considerably above its current low levels.

DEVALUATION FEARS INFLUENCE RISE IN ISRAEL HIGH-TECH REPORT INDEX

The Israel High-Tech Report Index weighed in at 43.23. At this level, it marked a new high for any single monthly reading in 1988. The previous high of 1988 was 43.00 on March 15, and since then the index has fluctuated in a narrow range between 35.65 and 38.81.

The November 14 high level was 17.7% higher than that recorded a month ago. A major reason behind the increased valuation of the 10 shares is connected with the rise of Elbit, which advanced from its October level of \$4.87 to its present \$6.25. Israeli investors have recently been bidding up shares of Elbit on the TASE on anticipation of a post election devaluation. Elbit, according to expectations with its \$260 million backlog, makes the company's shares an attractive hedge against devaluation and is one of the reasons behind the advance in the price rise.

	11/14/88	10/14/88
DJIA	2065.08	2133.18
S&P 500	267.74	275.50
NYSE INDUSTRIALS	181.55	187.35
ASE MARKET VALUE	289.39	302.55
NASDAQ INDUSTR'LS	365.69	382.56
ISRAEL HIGH-TECH REPORT INDEX*	43.23	38.78
*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		

SCITEX CORPORATION LTD.: A COMPANY REPORT

Three and a half years ago we chose to analyze the activities of Scitex (IHTR- 5/85), a prime example of a homegrown enterprise that had developed into a firm capable of using leading edge technology in innovative products. Scitex had become an important supplier of computer graphics systems to the international printing and publishing industries. Over a period of five years ending in December 1984, the firm had chalked up a promising record of a five year compounded annual growth of 49% in sales and a 58% compounded annual growth in net income. Sales for calendar 1984 were \$104 million, on which the company reported a net income of \$11.9 million. We followed the company as its fortunes turned downwards and watched Scitex's sales stabilize at \$132 million in 1985 and 1986 and rise to \$158 in 1987. However, in the 1985-86 period, Scitex went into a veritable tailspin; over eight successive quarters, beginning with the third quarter of 1985, it accumulated losses of \$56.9 million. Since then Scitex has achieved a major turnaround. It began in the third quarter of 1987 when Scitex began to show the results of a major restructuring. In that quarter it earned \$1.0 million and the next quarter it reported earnings of \$1.8 million. In the first nine months of 1988, the company's net income exceeded \$ 5.0 million. For all of 1988, the company is assured an all-time high record annual sales leading towards a net annual profit which could exceed the record 1984 figure of \$11.9 million.

A LONG SHOT FOR VENTURE CAPITALISTS

Industrial model making is a task which may take weeks or even months. Cubital Ltd., a joint venture of Israeli-based Clal Electronic Industries Ltd., Scitex Corporation Ltd. and Harwix, a private European investor, has already invested \$2.5 million and come up with a prototype, called SOLIDER, which could revolutionize the process of model making.

Cubital's SOLIDER is a novel output device intended for three dimensional CAD systems and computerized tomography scanners. The SOLIDER prototype converts CAD or CT digital representations of three dimensional models into actual physical objects. Conventionally, these models take weeks or months to manufacture manually or by CNC programming. SOLIDER carries out these tasks in a matter of hours and produces models up to a size of 14 x 20 x 20 ins.

The technologies employed include machine design, data processing, computer graphics, optomechanics and mechanical engineering. The SOLIDER hardware system includes a graphics workstation, an electro-graphic image generation subsystem, a model generation subsystem and the final treatment cell.

End use applications are only bounded by the designer's imagination but Cubital management sees the automotive, aerospace and toy industries as prime application targets. Market analysis indicates a prospect of sales of 300 systems in the first 5-6 year period, with each system selling at about \$500,000.

The company is seeking an additional injection of \$5 million. Potential second-round investors will be encouraged that there is one other company with a similar machine and it is beginning to enter the market-place.

SOFTWARE DEVELOPER GOES PUBLIC

Amnon Tal, president of Idan Software Industries - I.S.I. Ltd., recently announced that the ordinary shares of the company have been approved for inclusion in the over-the counter NASDAQ System under the symbol IDANF.

Idan Software Industries develops products for data retrieval, industrial training, education, medical simulation, and other vocational fields. Under the auspices of IBM World Trade, the company has created and is licensing a unique Advanced Courseware Generator System used to produce interactive training

programs for the IBM Personal Computer. The company has also developed a fast data retrieval program, TurboSearch, for publication and worldwide distribution by the Tate Publishing Division of Ashton-Tate Corporation (NASDAQ:TATE). Founded in 1985, Idan Software Industries is headquartered abroad and maintains offices in New York and Los Angeles.

AWARDS

TANNY RECEIVES H. DUDLEY WRIGHT AWARD

Dr. Gerald Tanny, Gelman Sciences Technology Ltd., president, received the H. Dudley Wright Achievement Prize for his research and subsequent development of ultra violet cured microporous membranes. Porous membranes, a combination of substrates such as textiles and paper offer the advantages of breathability combined with imperviousness to liquids. H. Dudley Wright, based in Geneva, is known internationally as a specialist in membrane technology.

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TECHNION AWARDS 1988 JULUDAN PRIZE FOR RESEARCH EXCELLENCE

The 1988 Juludan Prize for excellence in scientific and technological research, awarded each year by the Technion-Israel Institute of Technology, went to Prof. Zvi Kam of the Polymer Research Department, Weizmann Institute of Science, for his work on the "Development of a Laser Scattering Instrument for Medical Measurements of Ciliary Beat Frequency", and to Dr. Solange Akselrod, School of Physics and Astronomy, Tel Aviv University, for his research entitled "Measuring the Fetal Electrocardiogram (FECG) by a Reliable Non-Invasive Method".

The Juludan Prize was established in 1984 through the generosity of Mr. Daniel Falkner of London in order to award "outstanding scientific research achievements which show promise of having valuable scientific-technological applications and are channelled to enhance man's welfare and prolong the human life span".

PROF. YAKIR AHARONOV TO RECEIVE ISRAEL PRIZE

Prominent physicist Prof. Yakir Aharonov, of Tel Aviv University's School of Physics and Astronomy, has been awarded the 1988 Israel Prize in Exact Sciences for his role in the discovery of the "Aharonov - Bohm Effect", considered to be one of the most influential discoveries made in Quantum Theory.

Prof. Aharonov was born in Israel in 1932, and received his B.Sc. degree from the Technion - Israel Institute of Technology in 1956. He was awarded a Ph.D. degree from Bristol University, England in 1960. Prof. Aharonov has been teaching at Tel Aviv University since 1973, and is the incumbent of the Chair in Theoretical Physics established at the University with the support of an anonymous donor.

NEW CONTRACT

Inframetrics Inc., the wholly owned American subsidiary of Elbit Computers Ltd., has been awarded a

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U.S. Army contract for the production of M8A1 Chemical Agent Detectors. The amount of the contract is \$8.3 million. A spokesman for Elbit has announced that additional awards, related to the above, could lead to a total of \$20 million in sales.

BIRD MATCHMAKING HEADS FOR RECORD LEVELS IN 1989

A number of leading American industrial and software companies are among the twinned corporate partners, who will receive a total of \$9.5 million from BIRD in support of joint industrial research and development activities in the first six months of 1989. They include Westinghouse, GTE Spacenet, Computer Associates, Stratus Computers, KLA Instruments, Napco Security Systems, ElectroCom Automation and Schein Pharmaceuticals. The Board of Governors of BIRD - Israel-U.S. Binational Industrial Research and Development Foundation, at its November 10 meeting in Jerusalem, approved 19 new projects for the first six months of 1989. Dr. Ed Mlavsky, BIRD's executive director reports that in the past eight years BIRD'S total commitment to projects has exceeded \$46 million. Statistics indicate an impressive leverage of nearly eleven-to-one whereby each dollar of BIRD funding has resulted in \$11 of new products, more than \$500 million since its inception. Peter Jon de Vos, U.S. deputy assistant Secretary of State, who participated in the meeting, was highly optimistic as to the extension of BIRD'S activities. BIRD'S funds originate from interest earned on an endowment of \$110 million, which was provided equally by the two governments as well as from royalties on successful projects.

ELECTRO-OPTICS AND LASERS; A GROWING HIGH-TECHNOLOGY SECTOR

Conventional electronics are being challenged by new technologies,

especially lasers. Over the past decade, technological innovations based on optics have replaced many existing technologies. Some of the main areas are fiberoptic applications to telecommunications and computing, infrared technology for thermal imaging, computer vision and laser sensing for non destructive evaluation, laser medicine and surgery.

As a result, optics are continuing to move to the forefront and are leading a veritable boom in this particular field. Israel has a particularly strong optics R&D community with many of these high-tech companies involved in electro-optics and laser applications.

There are more than 85 companies in Israel active in electro-optics and lasers. They employ 7,000 scientists, engineers and technicians. Israel's greatest strength lies in infrared technologies; optical design and fabrication; atmospheric transmission; optical non destructive inspection; laser surgery and medicine and solar energy.

READY SYSTEMS MOVES AHEAD WITH NEW PRODUCTS

Ready Systems, the surviving company of a merger of Medicom Computers Ltd. and the American Hunter and Ready (HTR-3/87), has recently announced that it has adapted the Sun-3, a standard development platform for the real-time software engineer product line. It also announced three new product releases for the Sun-3. One of these is CARDtools, an integrated set of specialized CASE tools that addresses the unique requirements of real-time embedded computer systems software.

Ready Systems, basing itself on the R&D carried out in Israel, offers comprehensive real-time embedded software engineer solutions for sun-hosted development.