

ISRAEL HIGH-TECH REPORT

A MONTHLY REPORT COVERING NEWS AND INVESTMENT OPPORTUNITIES

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June 1991 Vol.VII. Issue No.6

ISSN 0334-5307

From the Editor's Desk

Just Developing Technology Is Not Good Enough.

During a recent visit to Raytheon, manufacturer of the Patriot, President George Bush extolled the virtues of the "American worker who is pushing forward the bounds of progress and firing the engines of economic growth." But a recent report by newscaster Mike Wallace says the technological triumphs praised by the president are a thing of the past. According to Wallace, all the weapons used in the Gulf were designed over 15 years ago by a country which was a "master of electronic wizardry." The United States, he says, is now forced to turn to other nations, especially Japan, for many key components in the American arsenal.

In a world in which today's allies may be tomorrow's enemies, Japan's technological dominance may have serious political implications should it decide to curtail sales to certain countries, for example.

Given Israel's reliance on high-tech defense, it is not surprising that some of the systems developed are world class. Unlike America, which is only now considering the perils of technological dependence, Israel has experienced the trauma of having vital supplies embargoed at the worst of times.

Though Israel develops technologies essentially for its own use, its small size compels it to seek international markets and joint-marketing ventures. Friendly nations like the U.S. are key targets. Little publicity is given to such cooperation, but in the past month alone *IHTR* came across several examples which should serve as an incentive for the government to provide more funds for research and development.

A relatively small but meaningful deal was struck by R&B Enterprises of Pennsylvania, which acquired Elgal from Rafael-Armament and Development Authority, owned by Israel's Ministry of Defense. Why should an American high-tech innovator invest hundreds of thousands of dollars in acquiring a Carmiel-based outfit which employs fewer than 100 people?

"With the acquisition, R&B becomes the world's leading supplier for certain transient simulation equipment and services. This paves the way for development of transient generators capable of simulating almost any man-made or naturally occurring electromagnetic environment created by radiated or direct coupling resources," says Robert Goldblum, head of R&B.

A two-year-old company, Carmel Software Engineering, has developed a computer anti-virus which has been acquired for distribution by Central Point, one of America's leading developers and marketers of computer software. Central Point is marketing tens of thousands of the programs at \$129 each.

The two deals - the Elgal purchase by R&B and the sale of software by Carmel Software - prove that Israel possesses know-how of international value. Perhaps we should invest the time, money and effort needed to develop technologies, products and systems which could be marketed without losing the benefits of ownership.

Israeli technology, especially in the defense sector, is so attractive that it is bought even by countries which do not maintain diplomatic relations. While Taiwan does not maintain diplomatic relations with this country, *IHTR* has good reason to believe the Taiwanese National Science Council will soon open an office in Jerusalem. Shared science and technology can make for better diplomacy than ping pong.

It makes one wonder which way policies should be aimed.

In this Issue

Just Developing Technology is Not Good Enough- Editorial Comment

Recent Developments-Quark; Camtek; Carmel Software;

Motorola; Plasma Coated Lenses; Sharnos; RTS; Industrial Park to Employ New Immigrants Israeli Companies on Wall Street; First Quarter Results Generally Favorable

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Israel High-Tech Report: Copyright 1991 Israel Publications Inc.

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RECENT DEVELOPMENTS

QUARK AND SCITEX ANNOUNCE SETTLEMENT

Quark, Inc. and Scitex Corporation Ltd. announced the resolution of all differences relative to the distribution by Scitex of QuarkXpress 3.0 within the Visionary page design/layout system. Concurrently, the two companies announced a long-term agreement whereby Scitex will develop Visionary extensions to QuarkXpress.

Under the ten-year agreement, Scitex extensions to standard QuarkXpress software will be developed. These will be written so users will have access to revisions immediately, as well as a long-term uninterrupted upgrade path. Additionally, the Visionary extensions will work with all European-language versions of QuarkXpress.

In the past, Visionary users had to wait several months after a new QuarkXpress release for those features to be incorporated into their software and even longer for different language versions.

THE P'S AND Q'S OF PCBs

Camtek Ltd. under Zvi Netter, a Technion engineer with a working background at Elscint has developed a product called the V-Scan for visual inspection in PCB production. V-Scan offers an effective inspection tool at a moderate price, thus fitting between the rudimentary magnifying glass and very expensive fully automatic optical inspection systems.

Small and medium size PCB shops producing quality multilayer PCBs may benefit from this advanced inspection tool. A special Artwork inspection model is also available – it is attractive also for very large PCB shops. A PCB shop introducing a V-Scan draws immediate benefits: product quality is improved, scrap is reduced and production cycles become shorter.

V-Scan inspection is performed by an optimum combination of human brains and computer brawn. The system scans the panel or artwork and compares it to a 100% reference derived from the master artwork or CAD data. Any deviations are instantly and clearly shown on a color monitor. The operator may immediately verify – and often repair – the indicated problem.

V-Scan does not have the limitations of AOI systems, in which Design Rule Checking means that all parts and shapes of each circuit are compared on a pixel-by-pixel basis to the reference – without limitation.

V-Scan systems have been installed in Europe, Japan and North America. Camtek is seeking to enlarge its niche for low cost solutions for printed circuit board inspection. Zvi Netter is now investigating joint venture or other possibilities to speed up the expansion of his company which is trying to expand its production to three major system units a month.

VISUAL STIMULATOR

Medical electronics is one of the best examples of how basic research can lead to commercially viable products. One outstanding new product which came out of an Israeli university is a new visual stimulator manufactured by Microshev. The innovative device, which measures electrical activity in the brain, is used to diagnose disorders in the visual system, and was developed at the Technion with financial assistance from the Office of the Chief Scientist of the Ministry of Industry and Trade.

The visual stimulator flashes changing patterns before a patient's eye to evoke activity along visual pathways in the brain. The stimulus most commonly used is a checkerboard in which the pattern of black and white squares is continually reversed. Researchers have found that such changing patterns evoke a strong reaction in the brain. Electrodes placed on the scalp monitor this reaction.

Several such visual stimulators are available commercially. However, since they are all expensive and big, only large clinics have the means and space to operate them. The Microshev is compact enough to be brought to a patient's bedside, and could become standard equipment in every hospital examination room. It also offers a color option, whereas previous stimulators only operated in black and white.

ENVIRONMENTAL SYSTEMS LTD.

Environmental Systems Ltd. is a new company which combines environmental protection with the provision of energy. It is based on one of the largest research programs ever carried out in Israel, which helped solve two major problems: disposal of waste and provision of energy. Israeli communal settlements and countries such as Italy, Yugoslavia and others have benefited from this project.

The process provides methane gas through anaerobic digestion of animal manure and vegetable waste. In the process of anaerobic digestion, complex organic substances are broken down by bacteria to form biogas, which is 60% methane and carbon dioxide.

The methane reactor has proven an excellent medium for algae growth as well. The algae can be fed, without drying, to many farm animals. The animals then create manure, from which methane gas is produced in a natural cycle that enables a farm to reuse solid, organic waste. In addition, the process produces a peat moss substitute that replaces imported moss.

CARMEL SOFTWARE ENGINEERING

Turbo Anti-Virus

The Turbo Anti-Virus software package includes 6 ways of fighting computerized viruses:

1. Detection of known viruses.
2. Removal of the virus code without damaging any of the files or boot sector.
3. Integrity check for files and boot areas which detects new types of viruses.
4. Permanent immunization for files against reinfection of the Jerusalem viruses.
5. Memory immunization for detection and prevention of known viruses infection in real time during daily work.
6. Real-time security system which will detect new viruses and prevent any damage they might cause.

NORTH HILLS ISRAEL LTD.

Has merged with Porta Systems Corp. The Israeli company specializes in developing and producing high-tech devices for Local Area Networks (LAN), particularly for the IBM Token Ring environment. North Hills has production plants in New York and Yokneam, Israel. Porta Systems Corp. have plants in the United States, Mexico, Puerto Rico, England and South Korea.

Porta Systems is engaged in telecommunications, recently signing a \$28 million contract with British Telecom. Among Porta's clients is Israel's Bezek. Porta's annual turnover is more than \$100 million dollars.

MOTOROLA IN \$10 M. EXPORT AGREEMENT

Motorola Communications Israel has signed a \$10 million agreement with the U.S. company Toro for the marketing and distribution of its computerized irrigation systems. The key innovation of the Motorola system is its ability to control irrigation valves by remote control.

PLASMA-COATED LENSES

Optiplas, a plastic lens manufacturer located on Kibbutz Usha, has installed equipment for coating plastic lenses using surface-treatment-designated

plasma technology which reflects light and protects the lens from scratches. Until now, this coating was only available abroad.

SHARNOA SYSTEMS TO SPAIN

Sharnoa Electronics has signed an export agreement worth \$1 million with its Spanish distributor in Barcelona. Sharnoa will supply the agent with eight sophisticated chip-processing systems, including advanced laser sampling systems. Sharnoa has been active in computerized chip processing control systems for the past 15 years, and over 2,000 of its systems are operative world-wide.

RTS EXPORTS GROWTH

RTS Relational Technology Systems, the Jerusalem-based software manufacturer, exported \$800,000 in software during 1990. The company, established three years ago by Samuel Hachohen and Vladimir Morgenstern, employs 55 professionals including many young engineers and new immigrants. The company recently received a \$700,000 order from an American marketing firm.

ECI TELECOM LTD. ANNOUNCES \$28 MILLION DIGILOOP ORDER

ECI Telecom GmbH has been awarded an order by the German telephone administration, the Deutsche Bundespost Telekom, totalling approximately \$28 million at current exchange rates. The order covers a newly developed Digiloop product, the PCM-4.

JESSELSON INVESTS IN ELITEC

The Jesselson Group of the U.S. has purchased shares in Elitec Industries worth NIS 1 million - a 15% interest in the company.

Elitec, which develops commercial application and communication software, is looking to expand its activities in communications. Shareholders now include Formula Systems (47%), the Jesselson Group (15%) and Elitec Chairman Ami Erel (10%). The remaining shares are traded on the Tel Aviv Stock Exchange.

INDUSTRIAL PARK AT JCT TO EMPLOY HUNDREDS OF IMMIGRANTS

Working with the Jerusalem Development Authority, the Jerusalem College of Technology is taking the first steps towards establishment of an industrial park adjacent to the JCT campus. The complex, whose 50,000 square feet will cost \$6,000,000, will house 50 teams working on R&D projects. About 500 employees, primarily new immigrants, will be involved.

Israeli Companies on Wall Street

Selected income and earnings summaries for the quarters as noted, unless otherwise indicated. Nearly all of these companies are intensively export oriented. Prices are as of May 16, 1991 and the price changes relate to those a month ago.

<u>Company</u>	<u>Revs</u> (in \$ mil.)	<u>Net Income</u> (in \$ thou.)	<u>Price</u> (in \$)	<u>Net</u> <u>Change</u>
ELBIT COMPUTERS Defense electronics ELBTF OTC	95,775 Q1	5,733	18.625	-0.125
ECI TELECOM Telecommunications ECILF OTC	22,368 Q1	5,070	27.125	-4.125
ELSCINT Medical imaging ELT NYSE	45,173 Q1	3,200	4.500	+0.375
FIBRONICS Fiberoptics FBRX OTC	14,047 Q1	362	9.125	+0.375
INTERPHARM LAB. Biological products IPLLF OTC	25,200 Q1-Q4	3,500	24.750	-4.750
LASER INDUSTRIES Surgical lasers LAS ASE	32,943 Q1-Q4	(4,052)	5.875	+1.125
OPTROTECH Electro-optical systems OPTKF OTC	19,491 Q1	126	7.500	-0.250
SCITEX LTD. Computer graphics SCIXF OTC	97,800 Q1	22,534	26.750	-2.000
IIS INTELL. Computer peripherals IISLF OTC	36,192 Q1-Q4	5,031	15.000	-0.625
TEVA PHARMACEUT. Pharmaceuticals TEVYF OTC	295,169 Q1-Q4	18,650	14.000	+0.750
ELRON ELECTRON. ELRNF OTC	96,00 Q1	3,000	10.875	+0.875

ISRAELI COMPANIES ON WALL STREET

MID-MAY: FIRST QUARTER ANNOUNCEMENTS

In the Middle of May a number of Israeli public companies announced their business results for the first three months of 1991. For those who question the apparent lateness of the reports we should point out that according to regulations covering NASDAQ (over-the-counter) traded companies these are generally allowed 45 days after the close of the calendar quarter to announce their results. The two leading hi-tech companies Scitex and ECI Telecom as we previously noted, were unaffected by the six week Desert Storm. Considering that 40 scuds fell on Israel during that period the ability to maintain full-scale operations into some may be surprising. However, those who follow these and other well managed hi-tech companies know that neither military reserve duty callups or even hostilities have interfered with daily activities.

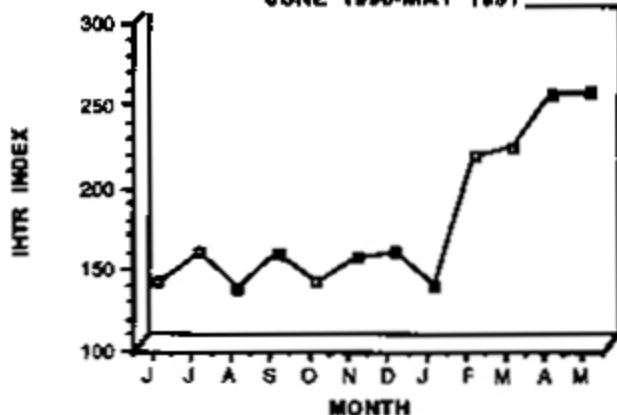
Scitex achieved the single sharpest gain in profits, of nearly 60% to \$22.5 million. Sales were up by 40% to \$97.8 million. The United States, Europe and Japan accounted for nearly all of the sales with Europe and the United States accounting nearly evenly for \$85 million. A marketing coup was achieved with two major systems sales in Yugoslavia. Scitex continues to link up desk top applications to its high-quality color production. Products sales geared to the rapidly expanding desk top publishing field are finding continuous acceptance. The SmartJet high quality color inkjet printer is being shipped "in large scale" quantities to American customers.

ECI Telecom reported a 30% rise in first quarter sales to \$22 million from \$17.2 million for the first quarter in 1990. Profits were up by nearly 40% to \$11.9 million from \$8.6 million. The company's board of directors has taken no decision as to any new public financing or as to a cash dividend payment. Perhaps the single biggest challenge to the company will be to expand its facilities in Israel and in the United States to cope with the influx of new orders. These orders will place a major strain on the existing production facilities.

Optrotech is still trying to stem a drop in profitability. Sales held up fairly well in the first three months of 1991 at \$19.5 million as compared with \$20.2 million in 1990. The company recorded a modest profit of \$126,000 in contrast with \$866,000 in 1990.

Oshap Technologies was the only company, to partially blame Desert Storm for poorer results. The company reported a net loss of \$420,000 compared with a net profit of \$1.5 million in the first quarter of 1990. However, managements projects a return to profitability by the end of the year. Sales in the first quarter were \$6.5 million from \$9.25 million.

ISRAEL HIGH-TECH REPORT INDEX
JUNE 1990-MAY 1991



MAXWELL REAPS THE MAXIMUM

Two years ago, the Mirror Group, owned by Robert Maxwell, bought a 26% interest in Scitex for \$39 million. Over the past six weeks, Maxwell sold 4% of these shares for \$43 million, showing a profit of \$36.5 million while retaining a 22% interest. Scitex shareholders include the Mirror Group, Discount Investment Corporation and Clal Electronics Industries; the remaining shares are traded over the counter in New York. Scitex specializes in the development and manufacture of interactive computerized image processing systems.

COMPUTER INTEGRATED MANUFACTURING CENTER

A Computer Integrated manufacturing (CIM) Center has been introduced at the Joseph and Rebecca Meyerhoff Technical College of Tel Aviv University. It is the first of its kind in Israel.

The Center includes sophisticated robots, computerized machines for metal working, modern systems for machine vision, a controlled industrial conveyor and automated storage. The entire system is controlled by a central computer.

"The CIM Center is unique in that a manufacturer is building and operating a system on campus, and together with us is developing a model that will serve both industry and the higher education system," said Rafi Aravot, general manager of Eshed Robotec. He

said the system – which operates 40 projects – is already in demand elsewhere. The company is building a similar system for an American university.

BIOTECHNOLOGY ON WALL STREET

BioTechnology General Israel, the Rehovot-based company engaged in genetic engineering and development of pharmaceuticals and veterinary products, is looking to raise capital on Wall Street. The company is planning a \$10 million public flotation. David Blac, a financial expert with a good reputation on Wall Street, holds a controlling interest in the company.

The share tissue is of special interest since the company's equity has shrunk to \$8 million following a loss of \$6 million in 1990. The company has invested large sums in research and development of a human growth hormone that has yet to be released.

RADA PROFIT DROP

Rada Electronic Industries, developers and manufacturers of military computers and avionics systems, registered profits of \$1 million in 1990 compared to \$1.3 million in 1989 – a drop of 30%. Sales turnover totaled \$24.5 million versus \$22.1 million in 1989. The company has received a breakthrough order for civilian aircraft test equipment from a North American company, and sees large potential in this area. Rada is owned by the Nissenson family (13%) and a group of investors headed by the Perelman family (40%); the remaining shares are traded on Wall Street.

LASER INDUSTRIES REBOUND

Sales of Laser Industries in the first quarter of 1991 amounted to \$8.6 million compared to \$7.5 million for the same period in 1989 – an increase of 14.3%. Net income for the quarter was \$81,000 or \$0.02 per share compared with a net loss of \$1.0 million or \$0.20 per share for the same quarter in 1989. In 1990 Laser lost \$3 million on sales approaching \$33 million.

Laser Industries specializes in the design and development of medical laser systems marketed under the trade name Sharplan. Shares of the Tel Aviv-based company are traded on the American Stock Exchange.

OSHAP PROFIT DROP

Oshap Technologies, whose shares are traded over the counter in New York, ended 1990 with a net profit of \$2.9 million compared to \$3.1 million in 1989. Sales in 1990 totaled \$39.8 million, an increase of 8.9% over 1989 sales of \$36.5 million.

Both 1989 and 1990 profits include capital gains from stock issues, which in 1990 amounted to \$1.4 million. Company officials said the decrease in profits was due mainly to delays in subsidiary Robocad supplying significant orders scheduled for delivery in 1990. The value of these orders will be reflected in the 1991 results. Oshap designs and manufactures automation systems, medical machinery, heavy machines and automation software.

OPHIR OPTRONICS GOES PUBLIC

Ophir-Aryt Optronics is about to become a public company through its first flotation on the Tel Aviv Stock Exchange. The company is offering 25% of its share equity to bring in \$2 million. The Jerusalem-based firm manufactures and markets optic components and laser precision instruments.

A 50.1% interest in Ophir was held by Geotek until last month, when the three founders of the company purchased Geotek's share in exchange for \$1.5 million. Ophir's shares are now held by Dr. Ephraim Greenfeld (50%), Dr. Ya'acov Zerem (30%) and Dr. Ephraim Sekumsky (20%) – three physicists.

Ophir was formerly part of Aryt Industries, owned by businessman David Kolitz. In December, 1989, Aryt was sold to Istec of the Yisum group. During the first half of 1990 control was acquired by Geotek, whose shares are traded over the counter in New York.

INSTITUTES OF HIGHER LEARNING

OF MICE AND MEN AND BLOOD CELLS

A long-sought goal of hematology and immunology researchers – the stable transplantation of human blood-forming tissue to laboratory mice – was recently carried out at the Weizmann Institute. The sophisticated bone-marrow transplant procedure they developed enables mice to survive for extended periods with a hemotopietic system that produces mature lymphocytes of human origin. This new tool is expected to advance the study of blood and immune system diseases in man, and may eventually provide convenient and reliable models for testing cures.

According to team leader Prof. Yair Reisner, this tissue transplant bridges the tremendous biological and genetic gap between mice and men. Because much research into blood and immune system disease involves animal systems, researchers cannot be sure that their findings can be applied to man. Professor Reisner reports that there are many

possible uses for his blood-system transplanted animals. "I hope to be able to infect these mice with HIV, the cause of AIDS, which attacks human cells and not those of normal mice. We could also use these animals to study gene therapy as applied to inherited or malignant blood disorders. Genes can be introduced into human bone marrow cells and the behavior of these engineered cells examined in mice. In addition, we expect to be able to immunize mice and harvest their sensitized B cells for the production of human monoclonal antibodies. One could likewise use bone marrow from leukemia patients for transplantation into mice for the study of human leukemia - and perhaps its therapy."

A report on this development appears in the latest issue of *Science*, the journal of the American Association for the Advancement of Science.

...AND NOT A DROP TO DRINK

One method of alleviating Israel's drastic water shortage was discussed by 80 water experts at a workshop held at Ben-Gurion University's Jacob Blaustein Institute for Desert Research at Sede Boqer recently. Participants in the workshop, organized by Professor Gideon Oron and Dr. Asher Brenner of the Institute's Water Resources Center, discussed various technical and economic factors in the use of purified domestic wastewater for irrigation.

In arid regions there are several types of marginal water - saline water, floodwater and industrial and domestic waste - explains Professor Oron. Of these, domestic wastewater is the most easily available and treatable, and there is growing awareness throughout the world of the great potential of this source for supplementation of agricultural irrigation resources.

In Israel, a new pipeline (known as the "third carrier") conveys treated domestic wastewater from the Dan region to the western Negev, and the treated domestic waste of Beersheva is used to irrigate Negev fields. This recycling not only alleviates water shortages, but can help prevent contamination of underground water resources.

Treated domestic wastewater has been used in Israel for some years to irrigate industrial crops such as cotton. Today there is increased interest in its use for food crops. Professor Oron is studying methods of irrigating sweetcorn for the canning industry with this water. He has developed techniques of subsurface trickle irrigation which save water and diminish environmental contamination of the crop. The experiments are being conducted at a farm outside Beersheva owned jointly by kibbutzim Revivim and Mashabei Sadeh. The kibbutzim are cooperating enthusiastically in these projects, which

hold promise for Negev farmers and for the Israeli agricultural export industry in general.

MICE DIABETES CURE COULD LEAD TO EARLY DIAGNOSIS AND VACCINE

A peptide isolated by Weizmann Institute researchers has been used to cure diabetes in mice, and provide the basis for an early diagnostic test and vaccine against the disease in human beings.

The experiments on mice, conducted by Weizmann Institute Prof. Irun Cohen and his team, were described in April's *Proceedings of the U.S. National Academy of Sciences*.

Prof. Cohen's experiments are an outgrowth of his research into autoimmune diseases, which include type 1 diabetes, more commonly known as juvenile diabetes.

In autoimmune diseases, the immune system's T cells, which are meant to fight foreign invaders, attack the body's own cells instead. The destructive process is triggered when T cells "recognize" a peptide on a particular protein in the healthy tissue. In the case of type 1 diabetes, the insulin-producing beta cells of the pancreas are gradually destroyed. In the initial stages, unaffected beta cells compensate by producing additional insulin. However, once some 90% of the beta cells have been eliminated, those remaining can no longer produce enough insulin to meet the body's needs. At this point, a person must begin receiving daily insulin injections to prevent what would otherwise be a fatal glucose imbalance.

Thus, symptoms of the disease do not manifest themselves until long after the autoimmune T cells have begun their attack.

In their paper, Prof. Cohen and his team reported that they had isolated the peptide (a segment of a protein) that is recognized by the renegade T cells that cause type 1 diabetes in mice.

They found that by introducing the peptide into

Israel High-Tech Report Index*

252.62 + 0.01 %

*ISRAEL HIGH-TECH REPORT INDEX is a weighted index made up of the shares of leading high-tech companies.
BASE=100 AS OF Sep 30, 1984

diabetic mice, they were able to abort the autoimmune attack while the mice still had enough beta cells left to supply sufficient insulin. Some 90% of the experimental mice were cured of the disease in this way.

The researchers also found that the peptide could be used to identify mice that had developed the autoimmune condition which precedes overt manifestation of the disease: those mice that produced T cells which recognized the peptide eventually became diabetic, whereas those that did not produce T cells remained healthy.

The peptide, synthesized from part of a sequence of a protein present in human beings, may form the basis of both an early diagnostic test and a vaccine against diabetes in human beings. Preliminary tests indicate that at least some patients who develop diabetes have T cells that respond to this peptide. Further tests are underway to determine whether this is the case with all diabetics. In addition, the researchers are checking whether this reaction occurs while the body is still able to produce sufficient insulin. If it can be shown that this reactivity marks the onset of the autoimmune destructive process, then the peptide might serve as the basis of a blood test which would enable doctors to detect the condition before it becomes irreversible.

Moreover, if the peptide can indeed identify individuals destined to develop the disease, it might also form the basis of a treatment that would abort the autoimmune attack before symptoms appear - a vaccine.

COTTON STALK SHREDDER

Cotton stalks must be removed from fields as soon after the harvest as possible in order not to provide cover for dangerous pests which would damage the next growing season. Clal, Israel's second largest industrial concern, is exporting an innovative cotton stalk extractor developed at Technion. The extractor is currently in use in Australia, Israel, and the United States.

Called the USM (uprooter, shredder, mulcher), the system was originally designed to cope with the challenging conditions in Israeli cotton fields at the end of the growing season. The hot, dry weather hardens the soil, and makes it difficult to pull out stalks with their roots. The machine developed at the Technion Faculty of Agricultural Engineering uproots and shreds cotton stalks, and then plows them under.

The Clal-produced tractor uproots the plants, lifts them, and feeds them through a chopper at about 10

km an hour. The material can then be either buried below the surface, where it no longer will support pests but will enhance soil quality, or it can be loaded into a hopper and stored for use as a fuel in special burners.

NATURAL SUGAR FROM CITRUS PEELS

Some 700,000 tons of citrus fruit are processed annually by Israel's canning industry, mainly for the production of juices and concentrates. About 350,000 tons of peels - a by-product - were previously used as a cheap cattle feed.

A new method developed by Technion researchers in the Department of Food Engineering and Biotechnology, in a project supported by Israel's Citrus Marketing Board and the Ministry of Commerce and Industry uses juice extracted from citrus peels to reduce the need for sugar purchases by more than 10,000 tons a year.

The Technion process, which leaves a sweet liquid which costs 20% less than imported sugar and which can be used in a variety of products, requires no chemicals, and uses only a small amount of energy. Until now, the sugar found in peel extract could not be used because the juice was extremely bitter.

DIAMOND INDUSTRY INNOVATIONS

For more than two decades, Technion's Diamond Laboratory has developed advanced machinery for one of Israel's largest industries. As a result of the reputation it built, the laboratory was chosen to help the RCA Corporation develop diamond heads for video tape recorders.

An improved model of a fully automatic machine for polishing 16 facets, called the David III, will be manufactured by Amcoram, an Amcor subsidiary. The machine polishes diamonds with more accuracy than can be achieved by hand, and one operator can serve as many as eight machines at once.

Technion scientists also designed a girdle-polishing machine called Dafna, which was introduced 15 years ago (the "girdle" refers to a diamond's center). Both Kulso and Verukowsky manufacture versions of the machine. There are 5,000 Dafnas in use in the world today.

The Diamond Laboratory has also produced two models of a bruting machine, the latest of which is being tested in Israeli factories. In bruting, a piece of whole diamond, instead of diamond powder, is used to shape another diamond. Today bruting requires employment of the full weight of the bruter's body against a hand-operated machine.

This machine will enable one bruter to operate six to eight machines, and will increase production. The final model will also be produced by Amcoram.

This series of machines is rounded out with the development of a sawing machine, which will also be produced by an Israeli manufacturer. Technion researchers say the new machine will cut more quickly, will create less diamond powder, and will to some extent be able to saw knots – seams between two crystals in a diamond that are hard to work and may cause the diamond to shatter. The new machine also allows for automatic feed of the diamonds.

INFRARED RADIATION SENSOR

A series of highly sensitive infrared instruments and related laboratory equipment, based on innovations in Technion's Electro-Optics laboratory, is now available for export from CI Ltd. of Ramat Yishai. The central instrument of the series, the SRJ000, is a result of a new optical approach to infrared remote sensing. A spectroradiometer, it is sensitive to temperature changes of only a fraction of a degree at instances of 10 km.

Infrared light is radiated by all bodies. While not visible, this light can be sensed by special detection systems. An understanding of this radiation can offer solutions to many practical problems, as well as giving a better understanding of nature. Applications include atmospheric phenomena, pollution studies, detection of plant disease, quality control, geological applications, and in the military field, signature analysis. It can be employed in planes to characterize farmland, or in the camouflage of military targets.

The SRJ1000 enables studies of infrared radiation at great distances. The instrument is more sensitive, simpler to operate and about half the price of equipment already on the market. CI exports to most European countries, the U.S. and Latin America.

COMPUTERIZED READER FOR BLIND PEOPLE

"This computerized reader for the blind joins other equipment at the University of Tel Aviv in the bid to develop human capital," said TAU Dean of Students Prof. Gideon Fishelson at the inauguration ceremony of the instrument, which is housed in the Brender-Moss Library of Social Sciences and Management.

The computerized reader was donated to the University by the Welfare Services Department of the Municipality of Tel Aviv, from the estate of Lottie Katz of Switzerland.

The origins of the instrument go back 10 years,

when Austrian Jewish inventor Ray Kurzweil developed a system enabling the conversion of optically read letters into computer signals. Through an equally complicated technology, the computer signals were in turn converted into vocal signals. But the high price (\$200,000) deterred potential users.

Xerox succeeded in developing an instrument at reasonable cost, named after the inventor Kurzweil. The device is operated by placing a page of text on an automatic scanner, which translates it into computer signals. Within seconds, users hear the text at their desired pace. A choice of nine "voices" is available, such as young, old, male and female. A manual scanner enables the location of specific lines in the text.

Areas of pictures and graphic illustrations are also identified by the scanner, although it cannot read them. The internal memory of the system includes up to 40 pages of text and may be connected to a computer – or to a tape recorder, an idea developed by Danny Barak, engineer at the Weizmann Institute, who specializes in improving aids to the blind. The user may then take a cassette home and listen to the text several times.

Currently the instrument reads in English only, since developing Hebrew-reading software has proved problematic. Accordingly, the Municipality has donated the reader to TAU on condition that all of Tel Aviv's English-speaking blind can use it. Among the 800 blind known to the Municipality, some 100 speak English and have been invited to use the reader. "We have invited students of Bar Ilan University to come and use the reader," adds Ziva Lahat, chief librarian of the Brender-Moss Library.

MOLECULAR MIMICRY

Professor Abraham Shitzer at the Weizmann Institute specializes in a relatively new discipline known as "biomimetic chemistry," which aims at designing the simplest possible synthetic molecules to reproduce the performance of much more complex natural products. This is expected to provide tools to probe and influence biological phenomena, and to duplicate specific biological functions with entirely man-made systems.

Prof. Shitzer has designed and synthesized compounds that reproduce one of the most basic properties of natural products – their capability to selectively recognize and bind a very specific ion or molecule. The design of many of these compounds has been greatly assisted by computer modeling carried out in collaboration with Prof. Shneior Lifson and Dr. Clifford Felder at the Institute's Department of Chemical Physics. One family of synthesized

compounds mimics the recognition capability of natural iron-binding molecules such as enterobactin, ferrichrome or coprogen. Prof. Shanzer's ferrichrome analog has successfully promoted growth in certain micro-organisms that would otherwise have died because their own iron-accumulation mechanisms are defective.

In related work, Prof. Shanzer recently succeeded in using biomimetic analogs of ferrichrome to inhibit the growth of pathogenic organisms. This was achieved with membrane-permeable ferrichrome analogs that selectively remove iron from blood cells invaded by malaria-causing parasites. Deprived of iron, these organisms died. This work was carried out together with Prof. Y. Cabantchick of the Department of Biological Chemistry at the Hebrew University of Jerusalem.

Prof. Shanzer – in collaboration with Prof. Israel Rubinstein (Dept of Materials Research) and Prof. Jacob Sagiv (Dept of Environmental Sciences and Energy Research) – has also used biomimetic chemistry to produce an artificial membrane just one molecule thick. When bound to a grid electrode, this membrane recognizes a specific metal ion in the presence of other ions, and thereby serve as a molecular sensor. Such monolayer membranes may aid in the study of elementary electron-transfer processes, and contribute to the development of molecular-based technologies.

CANCER, MALE INFERTILITY AND CHANGES IN DNA PACKAGING

A previously unrecognized mechanism by which chemo-therapeutic agents may destroy cancer cells has been identified by Dr. Minsky of the Weizmann Institute's Organic Chemistry Department. These studies also help explain why patients being treated with antitumor drugs suffer various negative side effects, including hair loss and a sharp decrease in sperm production.

According to Dr. Avi Minsky, leader of the organic and structural chemists carrying out the work, DNA-binding antitumor agents were commonly believed to act by chemically damaging a cell's genetic complement through locally acting mechanisms that produce deletions or abnormal modifications in its genetic code.

The recent Institute investigation has shown that widely used chemotherapeutic agents – among them, distamycin, chromycin, daunomycin and actinomycin D – also prevent packaging of DNA into the stable compact structures required for normal functioning. This disruption of the complex three-dimensional architecture of genomic material

could be responsible for the toxic effects of these drugs on rapidly dividing normal and cancerous cells, which are constantly reproducing and synthesizing new DNA molecules.

In order to study the effects of drugs on DNA packaging, Dr. Minsky and colleagues refined a procedure for producing well-packaged DNA molecules *in vitro*. Using calf thymus DNA, a series of widely used antitumor drugs were introduced and found to interfere with, or completely prevent, the packaging process. These results were obtained through a reading of the DNA's optical properties, and confirmed through studies under the electron microscope.

Dr. Minsky found that even small quantities of drugs prevent condensation processes of nucleic acids, required during the formation of chromosomes or during the tight encapsulation of sperm-cell DNA. He also discovered that the more effective an anticancer drug, the greater the damage it does to DNA packaging.

Since all the drugs tested showed a clear correlation between effectiveness and destructiveness, Dr. Minsky concludes that the drawbacks of chemotherapy with regard to fertility are inherent, and that alternative approaches, such as radiotherapy or techniques involving molecular biology should be pursued instead.

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