

### PRESIDENT'S REPORT 2012

(A)

# It starts here.

**Cover:** Artistic impression of a non-repeating quasicrystal pattern showing fivefold symmetry. Quasicrystals were discovered by Technion Distinguished Professor and Nobel Laureate in Chemistry 2011, Dan Shechtman.



All great ideas start with a silent, creative space in which inspiration is born. In 1912 there was no state of Israel. there were no universities in the Middle East, and there was no infrastructure. But there were dreams of courageous noble endeavor and the power of inspiration. 100 years ago, on April 11th, 1912, that big idea found form in a cornerstone - of the first university in the Middle East: Technion -Israel Institute of Technology. Israel's first and greatest start-up was born.

quasicrystal diffraction pattern

# It starts here.

# "Everything started at the Technion."

- Yossi Vardi, Technion graduate and serial entrepreneur

### Full circle cornerstone 2012

Welcome to this centennial edition of the President's Report. One hundred years ago, we started at ground level. There were no buildings, few engineers, no funds for salaries or equipment and no reason to believe that anything would come of such an ambitious enterprise. The slow and difficult development of the Technion traversed two World Wars, the founding of the independent State of Israel, and many more regional wars, in which the Technion relentlessly adhered to its vision of scientific leadership while dedicating itself to the development, health, and security of the State of Israel and humankind.

Today, Technion, with over 70,000 graduates,

has impacted millions of scientists, students, entrepreneurs and citizens worldwide. Of the 300 non-American NASDAQ companies, 72 are based in Israel, and of those. two-thirds have Technion graduates at the helm. A flood of innovations has originated from Technion: memory sticks; the Ziv-Lempel data compression algorithm; Azilect<sup>®</sup>, for treating early-stage Parkinson's; deciphering the secrets of the ubiquitin protein degradation system, or the exotic structure of quasicrystals.

Technion graduates not only start businesses, they also manage and lead them. Of Israel's top 125 business leaders, one third are Technion graduates. Technion-educated pioneers lead nine of Israel's top ten exporting companies, which account for nearly half of Israel's \$45 billion in annual exports. Together, investment in the Technion gives a remarkable 76 percent return, according to a recent study by Technion Profs. Shlomo Maital and Amnon Frenkel, published in *Technion Nation*.

Technion's Electrical Engineering and Computer Science faculties led the birth and growth of Israel's high-tech industry. It is no surprise that industrial giants such as Google, Microsoft and Intel are so deeply involved with Technion, employing many students even before they finish their studies. To maximize this success, the two faculties joined forces this year to form the Technion Computer Engineering Center (TCE), designed to build on this global leadership.

Technion reaches its centennial year with the blessing of a new Nobel laureate - the third Technion scientist to receive the world's highest honor in seven years. In many ways, Distinguished Prof. Dan Shechtman exemplifies all that is Technion. His discovery of quasicrystals – a new form of matter – showed scientific authenticity and the courage to pursue that which is entirely 'out of the box' relative to conventional understanding. His insistence on his discovery

# "An ambitious enterprise."

- Prof. Peretz Lavie

in the midst of rejection and his recruitment of scientific allies shows a spirit of determination and collaboration. Throughout the years Dan's dedication to students and his cultivation of a grounded, entrepreneurial spirit through a synthesis of networking, innovation and passion to make Israel



(*l-r*) Technion President Prof. Peretz Lavie; Cornell President Prof. David J. Skorton; New York City Mayor Michael Bloomberg at the announcement of the historic partnership, December 19, 2011.

strong, exemplifies the ingredients of Technion's global success.

In December 2011, the world's eyes turned once again to Technion with the announcement that Technion and Cornell University had been chosen by NY Mayor Bloomberg to launch the Technion-Cornell Innovation Institute (TCII) in New York City. This unprecedented venture is a new paradigm in education. TCII is positioned to energize the economy of New York. It also represents Israel's first step into academic globalization, and the impact of this new cornerstone will be felt worldwide.

This year, I joined Israeli students on a visit to the site of the concentration camps of Auschwitz-Birkenau in Poland. Together with those talented young people – the bright minds of the future – in that desolate place, we were able to feel and say to our ancestors: "It's OK. We did it. We won."

Enjoy the 2012 centennial issue of the President's Report. I hope you will join us in creating the hope, inspiration and excellence for centuries to come.

Prof. Peretz Lavie Technion President



Technion centennial stamp issued by the Israel Postal Company in February 2012.

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The page in Dan Shechtman's lab logbook recording his April 8, 1982, discovery.

### Prof. Dan Shechtman receives the 2011 Nobel Prize in Chemistry

On December 10, 2011, Technion Distinguished Prof. Dan Shechtman became Israel's 10th Nobel Laureate. Israel has four Nobel Laureates in Chemistry, of which three are Technion faculty. Sole recipient of the prize, Shechtman closed a circle of scientific discovery, isolation, progress and triumph resulting in a change in the classical laws of crystallography to include a new form of matter – quasiperiodic crystals. In his speech, after receiving the Nobel medal from Swedish King Carl XVI Gustaf, the 70-year-old chemistry professor said it is a scientist's duty to promote education, rational thinking and tolerance.

# also known as:

# "Science is the ultimate tool to reveal the laws of nature, and the one word written on its banner is 'truth'."

-Dist. Prof. Dan Shechtman, in his acceptance speech, December 2011

# 1982

April 8, 1982. While on sabbatical at the National Bureau of Standards in Maryland, Dan Shechtman discovered the icosahedral phase that opened the field of quasiperiodic crystals. Today, he says, he is joined by hundreds of enthusiastic scientists worldwide. "Without these dedicated scientists the field would not be where it is today."



Meeting at the National Institute of Standards and Technology (NIST)\* in 1985 just months after shaking the foundations of materials science with publication of his discovery of quasicrystals, Dan Shechtman, winner of the 2011 Nobel Prize in Chemistry, discusses the material's surprising atomic structure with collaborators. From left to right are Shechtman; Frank Biancaniello, NIST; Denis Gratias, National Science Research Center, France; John Cahn, NIST; Leonid Bendersky, Johns Hopkins University (now at NIST); and Robert Schaefer, NIST.





\*NIST was known as the National Bureau of Standards at the time.

#### 'Shechtmanite'

Today, 2011 Nobel Laureate in Chemistry Dan Shechtman calls them quasicrystals, but back in the '80s when the new class of matter was accepted only by a few, it was dubbed "Shechtmanite," after the man who guided the field through conception and infancy. The name "Shechtmanite" embodied the risk of humiliation if the material would indeed turn out to be a kind of "twinning," as Shechtman's opponents claimed.

Revealing a new kind of crystalline order, Shechtman demonstrated a clear diffraction pattern with a fivefold symmetry. The pattern was recorded from an aluminum-manganese (Al-Mn) alloy which had been rapidly cooled after melting. Shechtman's discovery was initially viewed with skepticism. "I feared for my scientific and academic career," says Shechtman.

#### fivefold nonrepeating pattern

### "The system here encourages originality. We are free thinkers. This is the Israeli spirit. Free thinking encourages successful scientists."

- Dan Shechtman, Distinguished Professor and Nobel laureate

In November 1984, Physical Review Letters published Shechtman's discovery in a scientific paper coauthored with three other scientists: Ilan Blech (Israel). Denis Gratias (France) and John Cahn (USA). Wider acclaim followed. mainly from physicists and mathematicians, and later from crystallographers. Pioneering contributors to the field of quasicrystals are Prof. Doy Levine of the Technion Faculty of Physics and Prof. Paul Steinhardt of Princeton University. Levine and Steinhardt made the connection between a theoretical tenfold symmetry model proposed by Prof. Alan Mackay and Shechtman's diffraction pattern, and developed the mathematical model for the structure of nonperiodic icosahedral phases found in metallic alloys.

Today, over 40 scientific books have been dedicated to quasiperiodic crystals, and the International Society of Crystallography has changed its basic definition of a crystal, reducing it to the ability to produce a clear-cut diffraction pattern and acknowledging that crystallographic order can be either periodic or aperiodic.

#### The Faith of Good Science

Dan Shechtman was born in Tel Aviv on January 24, 1941. His dream, while still in high school, was to study at the Technion. "In 1962, I commenced my studies in Mechanical Engineering at Technion. I graduated in 1966. There was a recession and no work, so I opted to continue for a master's degree."

Today, Shechtman is a Distinguished Professor. He holds the Philip Tobias Chair in Material Sciences, and heads the Louis Edelstein Center for Quasicrystals and the Wolfson Centre for Interface Science in the Department of Materials Engineering. He instigated the Technion course in Technological Entrepreneurship in 1986, referring to it as "my baby," and has overseen it annually ever since. Shechtman is invited to lecture worldwide about the Technological Entrepreneurship course, arousing much interest. He considers himself a missionary, "I coordinate the course with pleasure. I do it for Israel."

Between 2001 and 2004, Shechtman served as chairperson of the sciences division of the Israel Academy of Sciences and Humanities. Today, he continues to oversee the translation of the Nobel Prize scientific posters into Hebrew, and their annual distribution to schools throughout the country.

Shechtman has a favorite picture of a line of a dozen German Shepherds. In front of them, with self-assured insouciance, walks a serene cat. "I felt like that cat," he recounts. But his loyalty to his discovery never wavered. "A good scientist needs faith."

#### "The most important thing about the quasicrystals is their meaning for fundamental science.

They have rewritten the first chapter in the textbooks of ordered matter."

**Prof. Sven Lidin** 

Professor of Inorganic Chemistry, Lund University Member of the Nobel Committee for Chemistry

# cornerstone 2012 100 years ahead

December 19, 2011: All eyes focus on New York City and Haifa as a new paradigm of higher education is born. In a dramatic press conference given by New York City Mayor Michael Bloomberg, it is announced that Technion – Israel Institute of Technology and its Ivy League partner Cornell University have won a New York City contest to build an applied science campus with a grant of land on Roosevelt Island and \$100 million for infrastructure improvements. TCII – the Technion-Cornell Innovation Institute is born.

# Technion-Cornell Innovation Institute

OrnellNYC Tech Campus
 OrnellNYC

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### "Today will be remembered as a defining moment... In a word, this project will be transformative."

- NYC Mayor Michael Bloomberg

"The Technion was founded in 1912... 100 years later we come to New York to close the historic circle... The impact of this new cornerstone will be felt worldwide for centuries to come."

- President Peretz Lavie



# It starts here.

### "The Technion is among the world's leaders in turning science into careers and into products."

- Prof. David J. Skorton, President, Cornell University



At podium Prof. Peretz Lavie, Technion President. (r) Prof. David Skorton, Cornell University President.

Google CEO Larry Page announces the company's commitment to be the interim home of the Technion-Cornell New York City partnership.



*(l-r)* Google CEO Larry Page, Cornell University President David J. Skorton, TCII Founding Director Prof. Craig Gotsman, and New York City Mayor Michael Bloomberg.



(I) Prof. Craig Gotsman, Founding Director Technion-Cornell Innovation Institute (TCII) and Prof. Dan Huttenlocher, Founding Dean, CornellNYC Tech. On the eve of Technion's cornerstone centennial celebrations, directly after attending the Nobel Prize ceremony in Sweden in which Technion brought home Israel's tenth Nobel Prize, Technion President Prof. Peretz Lavie received the exciting news that Technion would be Israel's first university to initiate an institute of higher education in the United States. "I just came from Stockholm... this is as exciting as a Nobel," he said. "The Technion was founded in 1912... 100 years later we come to New York to close the historic circle. We are building the bridge between Israel and the U.S., Technion and Cornell, New York and Haifa."

The NYC Tech Campus is intended to bolster job creation in the city and generate some 600 spinoff companies and \$23 billion in economic activity over the next three decades, said Mayor Michael Bloomberg.

"The goal of the entire NYC Tech campus, and the TCII within it, is to turn NYC into the high-tech capital of the world," says Technion Prof. Craig Gotsman, Founding Director of TCII. "These engineers will receive a topnotch technical education, but beyond that, will work closely with affiliated companies during their studies."

TCII will offer a unique master's degree allowing students to specialize in one of three tracks or 'hubs'. The first hub is related to digital media, the second hub is related to medical informatics and devices, and the third hub to smart buildings, urban environments and infrastructures."

It will be a vibrant institute, located on the permanent CornellNYC Tech campus on Roosevelt Island, with some 100 faculty and more than 500 graduate students. It will be strongly engaged with and impact the local NYC high-tech industry and will be an integral part of the city."



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שם - תרועה לישראל

(*I-r*) Technion's three Nobel Laureates in Chemistry, Distinguished Professors Dan Shechtman, Avram Hershko, and Aaron Ciechanover, were guests of honor at the festive concert of the Shalom Zielony Technion Choir and Orchestra, marking the official opening of the cornerstone centennial celebrations. 10.90

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# world class.

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# "I will leave some excellent colleagues and great friends when I finish my degree, with relations that will hopefully remain my whole lifetime."

- PhD student Sebastian Reinartz

Attracted to Technion by the Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering and the pioneering research of Prof. Shimon Marom at the Network Biology Research Laboratories, Sebastian Reinartz from Germany is just one of the hundreds of graduate students at Technion immersed in life sciences and engineering research.

Reinartz has an ambition to control a single neuron within a living network and establish a method for studying the processes in neuronal networks that govern learning and memory.

"I was attracted by the creative concepts that were published by the group of Prof. Marom, and his openminded way of dealing with his students," says Reinartz.

"It is always advantageous to break walls. Some questions, especially when it comes to complicated issues like the brain, can only be solved by combining different scientific fields... There are international project collaborations, workshops and a multitude of invited speakers, so for me this is a great set-up.

Generally speaking, this place of intense multidisciplinary cooperation can stand as a role model for the future of science." 18 10

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Can you predict and change human behavior? Prof. Ido Erev of the Davidson Faculty of Industrial Engineering and Management says "yes." With a background in psychology, Erev is pioneering the multidisciplinary field of Cognitive Science, to set up models for decisionmaking and patterns behind behavioral risk taking.

Erev's research focuses on the effect of low probability events. An undesirable event would be having a

car accident as a result of risk-taking on the road. A desirable event might include winning the lottery. His research shows that people exhibit oversensitivity to rare events when they respond to a description of the incentive structure and when they plan their behavior, but they exhibit the opposite bias when they gain experience.

The results of his research have been applied to improve compliance rates of safety and hygiene regulations in factories and in hospitals.

"In factories, it's not enough to publicize safety instructions." Rule enforcement is particularly effective when it implies a high probability of gentle punishment. Field studies demonstrate that when a new policy was implemented, compliance with safety procedures increased from 50 percent to 95 percent.

Erev's research has been applied in factories and at the Rambam Health Care Campus.

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Advanced virtual tools will be a game changer in the buildings of the future. At the Les and Eileen Seskin Virtual Reality and Controlled Construction Laboratory of the Ecological Engineering Systems Center, researchers are applying innovation to create better building construction methods for the development of smarter, greener buildings.

The lab also supports communication between architects, engineers,

and builders, bringing the advanced tools needed to create digital representations at all stages of the building process, and to simulate real-world performance.

One benefit of such methods is less waste in actual construction, the removal of costly design errors and conflicts between building systems, and greater degrees of component prefabrication, such as complete plumbing.

# The science of healing



Aaron Winterstern MD - PhD student

For new recruit from Johns Hopkins University Prof. Beth Murinson, the science of pain is a critical part of medicine. Her research is focused on chemotoxic and traumatic injuries to the nervous system, and her aim is to decrease the pain factor as much as possible in nerve injuries and injuries to the back. "We're hoping to find a methodology that may prevent nerve injuries from becoming painful, as well as to develop neuroprotective strategies, as some drugs can do damage to the nerve system." Murinson is an attending neurologist at the Technion-affiliated Rambam Health Care Campus with a clinic specializing in painful neuropathies and nerve injuries. She teaches and mentors Israeli and American medical students in the Rappaport Faculty of Medicine.



U L T I N A

# The energy revolution

starts here.

Dr Carmel Rotschild

### power 2B

#### **Sunlight Reclaimed**

New recruit at Technion Dr Carmel Rotschild is leading a multidisciplinary team at the Faculty of Mechanical Engineering to develop innovative applications to maximize the energy we can harness from the sun.

On the one hand we have sunlight – an infinite source of energy – with a broad spectrum of every bandwidth in creation. On the other, we have silicon – an abundant material made from sand and the front-runner as the material most likely to be used in photovoltaic cells for solar energy panels. Between the simplicity of silicon and the broad spectrum of sunlight, falls the innovation.

As oil reserves deplete and energy prices rise, solar power is emerging as an essential source of clean, affordable energy. The scientific searchlights are on for new discoveries that could make solar energy competitive to fossil fuels.

Dr Carmel Rotschild – who arrived at the Faculty of Mechanical Engineering from MIT in August 2011 – has a dream to increase the efficiency of photovoltaics by around 20 percent, by developing efficient appliances to convert the lost rays of the sun that silicon is unable to process.

This involves the fusion (or up conversion) of infrared solar radiation to make that power accessible to silicon, and the fission (or down conversion) of radiation in the blue range to near infrared radiation. which could double the quantum efficiency of photovoltaics. The highly multidisciplinary approach includes the design and fabrication of nano-scale optical materials within an optical cavity, and Rotschild and his multidisciplinary team draw on expertise in nonlinear optics, materials engineering, and energy transfer in molecules.

"My research combines nonlinear optics and luminescent solar concentrators to build accessories for photovoltaics," explains Rotschild. "The main issue that limits efficiency. is the mismatch between the broad solar spectrum, and the narrow spectral response of photovoltaics. For example: silicon is very effective at one micron wavelength, but light with a longer wavelength cannot be converted into



electricity by silicon solar cells. It would be nice to look at nonlinear optics as a toolbox for converting inefficient parts of the solar spectrum into emissions where solar panels can be more efficient."

Rotschild's reception as a new recruit has been excellent, he says. "Everyone is enthusiastic to help and it's really good to be here. The students are great; the collaboration is great. The system really supports you."

Rotschild has a personal passion for creating cleaner, more efficient ways to power our world: he lost a friend to cancer and is concerned that air pollution was a chief culprit. And his belief in the urgency of the need to advance energy research in Israel is shared by the Grand Technion Energy Program (GTEP) and the Russell Berrie Nanotechnology Institute (RBNI) who are jointly supporting his work.

"The energy revolution is already here," says Rotschild. "If you include the cost that we as a society pay for using petrol, coal and fossil fuels in terms of health and pollution, we are reaching an era where solar energy becomes affordable for society.'

Rotschild says that multidisciplinary programs such as GTEP are powerful platforms for attracting scientists to Israel. "Energy is a key part of the Technion vision, and my lab is evidence of that," he says.

# "The energy revolution is already here."

- Dr Carmel Rotschild



#### Here Comes the Sun

Technion's GTEP has launched Israel's I-CORE for solar fuels – a national scientific center of excellence to develop the alternative energy supplies of the future.

Led by GTEP Director Prof. Gideon Grader, top Israeli scientists from Technion, Ben-Gurion University of the Negev and the Weizmann Institute of Science are pooling resources and brainpower to pioneer the energy solutions of tomorrow in the form of solar fuels. The Israeli consortium includes 27 senior researchers and is to expand to include returning Israeli scientists from the world's top universities.

The Center of Excellence in Renewable and Sustainable Energy will conduct research on fuel production through the use of sunlight, focusing on fuel production from plants (such as algae and various agricultural crops), breaking down water to generate hydrogen, and breaking down carbon dioxide for the production of fuels. The Center will provide unparalleled opportunity to advance this field on a national scale, through fruitful cooperation among institutions, and to leverage the research in Israel and abroad.

The subject of alternative fuels is high on the global scientific and industrial agenda as expanding populations, increasing standards of living and depleting oil reserves has created an urgent need to unlock new sources of energy. Helping to find solutions at the global level and reduce the world's dependence on oil will have a positive impact on Israel's security and status, whether or not those solutions are implemented in Israel itself.

Research in this field in Israel is still in its preliminary stages, but has tremendous potential to lead to significant breakthroughs, which the Technion-led I-CORE will facilitate. This Center of Excellence is an important step towards the

development of alternative fuels and reducing global dependence on oil. A key component of I-CORE will be the establishment of central laboratories to bolster intramural synergies and promote team endeavors across Israel. This in turn will contribute to the development of patents and commercial ventures in various spheres. I-CORE will also expand cooperation with partners in the United States and consortia led by the European Union.

#### **Fossil Smart**

With the discovery of offshore natural gas, and the new promise of offshore oil shale, Israel is entering a new era of energy production and consumption. To make the most of new resources, Technion initiated a new research and education infrastructure in natural gas and petroleum studies to train experts, in particular engineers. GTEP now offers a graduate degree in natural gas and petroleum (NG&P) engineering taught in cooperation with Haifa University's Department of Marine Geosciences. Initially, many of the courses will be conducted in English as experts will be brought in from leading international institutions. Technion is coordinating this initiative with the Ministry of National Infrastructure.

The Master of Engineering degree is available to graduates of civil, chemical, mechanical and aerospace engineering. It spans a study period of 15 months plus three months' project work, which will be implemented in the industrial sector.







# cyber heights

#### start here.

According to prize-winning computer scientist Prof. Hagit Attiya, despite the revolution in computing and communications experienced worldwide, the basic principles remain the same. Attiva is researching distributed computing the principles that govern systems with many computing entities. The work of Attiya and her colleagues allows your quad-core PC to multitask despite the vast number of conflicts that occur during a typical session or the distributed servers at the heart of Internet business to replicate vast amounts of data and still provide a consistent view of it.

Much of this unseen complex activity is taking place at distant servers where data is stored not locally on your PC or smart phone but at a remote facility reached through the Internet. "There are 'farms' of computing or storage servers - which are big, physical warehouses hosting numerous servers," explains Attiva, whose research studies how such computing entities communicate with one another and the degree of 'agreement' needed between them. "My specialty is how they coordinate their functioning, for example, creating a consistent order of updates, without agreeing - in situations where

'agreement' in the strict sense is impossible, due to asynchrony and failures," says Attiya.

As one of few female computer science faculty members in Israel, Attiya is eager to encourage other female scientists to realize their potential. "I believe in role models," she smiles.

"Technion students are terrific: really smart, innovative and on top of that, they are real fighters."





How could basic research into microbes found in our oceans impact humankind's exploration of the outer precincts of space?

Groundbreaking biological research by Prof. Oded Beja at the Emerson Family Life Sciences Building has uncovered that 10 percent of available energy reaching planet earth is harvested by marine bacteria.

"Scientists are seeking new ways to harvest energy that go beyond regular photosynthesis," says Beja.

Regular photosynthesis requires a multitude of genes, whereas the biological research unveiled by Beja shows that one single protein can accomplish the same job.

Prof. Oded Beja and his team on focused field trip to gather live samples.

Totally grounded on planet earth, Beja and his team of students are unravelling the mysteries of how the oceans of the world harvest the energy of the sun, through focused field trips to gather live samples from the photic zones of the Mediterranean, the Sea of Galilee. the Red Sea and the Dead Sea which it turns out is not so dead after all. "The main focus is metagenomics in which you look at the entire population of microbes at once, by collecting samples..." says Beja.

Even within our bodies, the majority of bacteria is uncultured. "This makes it hard to investigate them... in order to understand what bacteria are doing in their environment - we need to collect live samples. Photosynthesis is very important to the ecosystem of the planet... just as the oxygen we breath. About 50 percent of it is done by oceans and 50 percent of this by cyanobacteria."

The lab is now focusing on photosynthesis genes found in cyanophages (viruses that infect cyanobacteria) and on uptake and utilization of organic phosphates in different marine microbes.

BEJASAURUS

# oceans of science

"Photosynthesis is very important to the ecosystem of the planet." - Prof. Oded Beja

# innovation starts here

"T<sup>3</sup> understands the challenges of the entrepreneur. They know how to balance the needs of the entrepreneur and the academic perception." - NanoSpun CEO, Ohad Ben Dror

NanoSpun introduces a revolutionary platform for the fabrication of hollow and monolithic fibers and the encapsulation of elements such as enzymes, bacteria cells and drugs.

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#### T<sup>3</sup> Means Business

Cutting-edge innovation at the frontiers of multidisciplinary science, a streamlined, in-depth approach to technology transfer from the laboratory to the marketplace, and a powerful spirit of entrepreneurship that persists through the often turbulent process of making a raw innovation commercially viable: these are the known factors behind a university's success – and something else whispered in the halls of the successful: People. You need good people... team players.

#### NanoSpun: Keep it Pure

"Success is all about people," says Ohad Ben Dror, founder of NanoSpun, which after two years of intense groundwork was incorporated as a company in April of 2011. "We have a promising technology and a strong team that can drive the company to success."

Backed by prominent investors, the versatile, hollow nanofiber innovation first emerged from the laboratory Prof. Eyal Zussman at the Russell Berrie Nanotechnology Institute. Unique in structure and cost-effective in fabrication, the fibers can be tailored for applications in cleantech (water treatment), medical devices, solar energy, textiles, and packaging.

"We have received positive feedback from the market," says Ben-Dror.

At the forefront of the young company's agenda are applications in water

# "Success is all about people."

- NanoSpun CEO, Ohad Ben Dror

treatment – where there is a global demand for advanced and efficient systems for filtration and purification.

Based in the Gutwirth Science Park in Technion City, NanoSpun has already won international acclaim. In 2011. in Italy, the race was on at the Nano/Polymer Challenge as Nano entrepreneurs from across the world presented their innovative nanotechnologies, business plans, and long term vision to an international panel of judges. NanoSpun won the day, with first place in the Polymer category and a prize of €300,000.

#### Regenerate

"If you get a traumatic injury to the knee, very few treatment options are available," says Prof. Dror Seliktar, giving an example of one use of the innovative biodegradable hydrogels being marketed by a company he founded, Regentis Biomaterials.

"A replacement knee may eventually be required if the progression of the injury is not contained. If you are injured at age 25, it can be pretty daunting to know that at age 55 you may need a knee replacement. We can alleviate the progressive degeneration with a therapy that actually helps repair the tissue – intervening early on and preventing further degeneration."

Established in 2004, Regentis Biomaterials is commercializing innovative biodegradable hydrogels for



Gelrin™

the local repair of damaged cartilage and bone. The platform technology is a family of hydrogels called Gelrin<sup>™</sup>. These gels can be injected or applied to a specific local site.

"The company is pretty unique in Israel, and also in the world," says Seliktar. Regentis recently secured an additional investment of \$10 million to establish its European presence and to expand its ongoing clinical efforts of Gelrin<sup>™</sup>.

#### All Eyes on Super Resolution

An unblurred example of the dynamic process of technology transfer at the Technion is the start-up BETTERview – slated to revolutionize the quality of HD imaging. Taking advanced algorithms all the way from the research of Prof. Michael Elad at the Faculty of Computer Science (see page 38) straight to your TV, PC or smart phone, the patented innovation promises to break the "glass ceiling" of existing imaging technology, says the company. Among its services, BETTERview can convert and upgrade old and cloudy video material such as those pre-war wedding shots of grandma, YouTube material. or even recent TV programs filmed originally in Standard-Definition (SD).

The process in which several low-quality images are fused into a single, higherresolution outcome is known as Super-Resolution (SR). While conventional methods use conversion techniques to "blow up" or stretch the SD video onto an HD display, BETTERview increases optical resolution of a video stream, generating an HD stream of vastly superior quality.

"Technion has a rigorous academic atmosphere while being an innovative technological university. Questioning authority is welcomed here, because the **Technion aims at** giving students an independent and confident mind."

- International student, Yuting Wang

# Master of mortar

ISE student Yuting Wang.



International students get hands-on experience in Civil Engineering.

International student Yuting Wang was among five freshmen students to get on the President's List. All the students had an average of 91 percent or higher and are in the top three percent of their class.

Opened in 2009, the Technion International School of Engineering (ISE) is expanding rapidly, offering a full BSc program in Civil and Environmental Engineering, and a variety of study options. "Life here is amazing, especially if you are willing to spend some time exploring other cultures," says Sifang Shan.

"The small classes have helped me develop a close relationship with the other members of the program and the personal attention from the teachers and tutors has helped my academic skills," adds Ari Teger from the U.S.

Part of the mission of the International School is to

achieve academic excellence while introducing students to Israel.

"ISE makes it a top priority to acquaint students with this unique country, which is as rich in history as it is in scientific advances," says Academic Head Prof. Amnon Katz. "Through field trips, lectures and programs, students are immersed in Israel's past and present, becoming closely connected to this dynamic nation."

# the scientist behind innovation

# *"I really love Technion. This is my home."*

- Prof. Michael Elad



What goes through the mind of Computer Science Prof. Michael Elad when the photographer arrives to photograph him for the Technion 2012 President's Report?

"He could definitely use my algorithms," laughs Elad, "One day, all this will be completely avoided. One day soon I will be able to synthesise any image of myself without taking more than one photo."

It is hard to believe that scientific progress will ever ring the death knell of the photographer's art yet it might revolutionize the craft. The innovative research of Elad into signal processing, image processing, and computer vision was listed in 2010 by Thomson Reuters Science Watch. In 2012 he received the honor of becoming a Fellow of the IEEE – the world's largest association for the advancement of technology. "It is mainly because of the terrific luck I had in my research – into sparse representations - which became such a huge topic.

I caught this 'wave' and it took me with it. In the beginning, nobody cared much about it. But then it caught on, and today everybody is working on it."

Elad founded his own startup, as well as spending some years in industry including at the HP labs in Technion City, but he says he prefers basic science. He lets those with entrepreneurial passion apply his pioneering algorithms.

"I really love the Technion," says Elad, "This is my home." Indeed, Elad turned down an offer at Harvard in order to return to Technion. "I am thrilled to be part of a university that is leading worldwide and that is also Israeli. I believe that we are really excellent in science and I'm proud to be part of it."

Elad is a member of the Technion Autonomous Systems Project (TASP).



# come to life.

"We will have the research tools and knowledge to look at a person's genome and to choose the right drugs."

- Prof. Amit Meller

From the pure mysteries of basic research, through to medicine, biotechnology, genetic and environmental science, and the development of new diagnostic and therapeutic tools, the Lorry I. Lokey Center for Life Sciences and Engineering is Israel's meta center for research into life sciences.

Attracting top students from across the Technion faculties, scientists at the Lokey Center are joining together to unlock the mysteries of life, understand and heal disease, and apply knowledge for the benefit of all humankind. "For Israel, the Lokey Center represents the birth of a new form of life sciences," says Center Director Prof. Yuval Shoham, "After the vision, comes the implementation: the scouting for top new faculty, the building of structures and unique laboratories, the organization of the clusters, and the empowerment of teaching."

One of the key attractions of the Lokey Center, for new recruit Prof. Amit Meller, was that he saw the opportunity to integrate two sides of himself – basic science and applied engineering. "We are living in extremely exciting times with respect to how science is to be done," says Meller, who has nine patents in life sciences to his name, seven of which are already licensed.

"We want to be both useful and exciting. The combination of basic and applied science makes the experience of research much more enriching and interesting. Students from the biophysics side will always be challenged by the engineers... who know they can do it better. And when an engineer presents a better method – for example, for reading an RNA transcript, the scientist will challenge him with 'where is the question?' I really enjoy this kind of multidisciplinary intellectual interaction a positive tension among colleagues in the same group."

"My hope is that the way disease will be diagnosed in the next decades will be different from what we have been doing so far," says Meller, a global pioneer leading two labs at the Lokey Center at Technion and at Boston University.

"We will have the research tools and knowledge to look at a person's genome and to choose the right drugs. It's just a matter of bringing those technologies to the diagnostic market. Our genomes will be routinely sequenced. We will look for signatures and genome hangers that will alert us to danger, cause for worry, or specific needs."

### 42

# Great minds think different

2. ANAMETRICA

"The applications of today rest on the foundations of several decades of basic science research."

- Prof. Naama Brenner



#### **Superior Synergy**

From the advanced frontiers of the emerging science of nanomedicine, through to hands-on practical services such as those offered by the Bioinformatics Knowledge Unit (BKU) that offers life scientists customized computing tools, the Lokey Center is quietly seeding a scientific revolution.

One example of the multidisciplinary groups thriving at the Lokey Center is at the Network Biology Research Laboratory. "It's important to keep in mind that the applications of today rest on the foundations of several decades of basic scientific research," says Prof. Naama Brenner of the Faculty of Chemical Engineering.

And the grounded progress and investment in the science of tomorrow continues unabated at the Emerson Family Life Sciences Building. The year 2012 will see the establishment of the new Technion Center for Structural Biology (TCSB). The center, headed by Dr Hay Dvir, will offer facilities for macromolecular crystallography unrivalled anywhere in the Middle East – making Technion a magnet for life sciences worldwide.

The job done by the state-of-the-art X-ray diffractometer to be housed at the Center once would have needed a Synchrotron – a giant facility that would demand half the space of Technion City. "Nowadays, a revolution in brightness allows home-source beams to provide quality comparable to 2nd generation synchrotrons," says Dr Akram Alian, "This is a huge advancement in what we can do and in the quality of data we can obtain. With the investment of Mr. Lokey, Technion is now taking life sciences in Israel to a whole new league."

# the new pioneers

"My dream is to create a start-up," says French-born Deborah Cohen (*pictured above*), a graduate student in an elite Electrical Engineering program sponsored by the Meyer Foundation, Cohen has already delved into a variety of multidisciplinary projects.

Working with Prof. Yonina Eldar on signal processing, the two are tackling a theoretical question with many applications in the field of telecommunications.

Cohen's focus is to overcome the effects of noise by means of signal cyclostationary detection. This she presented recently at an international conference in Puerto Rico. "People from outside this research area told me that they now understand what 'sub-Nyquist barrier' means," she says.



![](_page_46_Picture_1.jpeg)

## "The Technion – Israel Institute of Technology is one of the cornerstones of Israel's development..."

- David Ben-Gurion, 1st Prime Minister of Israel

## SOME TECHNION FIRSTS

1st cornerstone of a university in the Middle East. 1st to integrate Hebrew as the official language of teaching. 1st class of engineers and architects in the Middle East. 1st female engineer in Israel. 1st student strike. 1st Department of Aeronautical Engineering in Israel. 1st to decode the ubiquitin system in living cells. 1st student-built microsatellite in space – Gurwin TechSat II. 1st to revolutionize data compression. 1st to launch the Israeli high-tech revolution. 1st isolation of human embryonic stem cells with University of Wisconsin-Madison. 1st in self-assembly with the "live" electricity conducting wire. 1st discovery of quasicrystals. 1st in worldwide research on solitons and light tunneling in quasicrystal arrays. 1st in 3D face recognition. 1st Nobel Laureates in science in the State of Israel. 1st pioneers of nanoscience and technology in Israel.

1st multidisciplinary center of energy science and technology in Israel.1st institute of technology to enter the New York City Tech Campus.

This is the story of how one stone can change the world...

This is Technion: Israel's first university and a temple of transformation. This is the place that showed the world that if you want it, it is not a dream.

![](_page_48_Picture_2.jpeg)

Technion: the rock on which the State of Israel is built, and whose impact is felt in all areas of our lives – from internet technology, to clean drinking water; from live images of Mars, to the flash drives to store them; from energy innovations, to nanoscale discoveries to revolutionize medicine.

![](_page_49_Picture_0.jpeg)

# 20th Century Dreamers

![](_page_49_Picture_2.jpeg)

# **1901** The Zionist dream for a Technikum

Theodor Herzl envisioned Haifa as "a great park... with an overhead electrical train... a city of magnificent homes and public institutions all made possible by applied science, engineering and technology." By the Fifth Zionist Congress in 1901, the pressure was on to address "the question of founding a Jewish university."

# 1912

In the year of the Titanic, and a rare, total solar eclipse, the cornerstone of the new Technikum was finally laid. On April 11, 1912, under the auspices of the occupying Ottoman Empire the local Jewish community turned out in honor of the festive cornerstone laying ceremony.

![](_page_49_Picture_7.jpeg)

![](_page_49_Picture_8.jpeg)

#### **The Architect**

Alexander Baerwald came with the first ever designs for a building of higher education in the Middle East. Baerwald – who used to play cello in a string quartet with Albert Einstein – was sought out to blend European form with Eastern elements.

![](_page_49_Picture_11.jpeg)

#### Jewish skilled labor

Applied skills were in short supply but construction continued through the power of dedication. Dynamite was imported to open a well to 100 meters depth – which would supply water to the whole city and transform Haifa, and provide a source of income for the young, impoverished Technikum.

![](_page_49_Picture_14.jpeg)

![](_page_49_Picture_15.jpeg)

**Good language** gave way to insult as Hebrew faced its first and most critical test in an emotional debate about the teaching tongue of the new Technikum: Hebrew or German? **WWI** would decide the outcome of the 'Battle of the Languages' in Haifa. With Germany's defeat, the powerful German influence on the new Technion also waned. *Pictured right, occupied Technion building.* 

![](_page_50_Picture_1.jpeg)

![](_page_50_Picture_2.jpeg)

**1923** Albert Einstein who heard of the postwar financial straits of the nascent Technion came to Haifa to signal his support. He visited workshops and planted a now-famous first palm tree in front of the new building. He returned to Germany to chair the world's first Technion Society.

**1924 Doors open** as the Technion enrolled its first students. The official opening ceremony took place in 1925. Its first class had 17 students (including one woman), who majored in civil engineering and architecture. It immediately became a center of skills for the Jewish people in the Holy Land.

![](_page_50_Picture_5.jpeg)

![](_page_50_Picture_6.jpeg)

**Technion gets a steam engine** as energy issues were already paramount in pre-state Israel. Technion expertise was sought by citizens of the new city of Tel Aviv to provide electricity. Technion became the power behind new roads and infrastructure connecting scattered populations.

# 1930s

![](_page_50_Picture_9.jpeg)

**It's all or nothing** as the Technion began absorbing large numbers of engineers and scholars fleeing the rising antisemitism in Europe in the 1930s. Technion staff walked the talk of independence by agreeing to work for nothing to ensure the institute's survival.

![](_page_50_Picture_11.jpeg)

**WWII** While many Technion students volunteered to join forces with the British in their battle against the Third Reich, the Technion building became an active center providing technology for defence and hosting the Jewish underground – notably, the Haganah.

![](_page_51_Picture_0.jpeg)

### 1948 The State of Israel is born

The declaration was celebrated by a Technion student body of 680. Shortly afterwards, three powerful new faculties were added: electrical engineering, mechanical engineering and aeronautical engineering.

![](_page_51_Picture_3.jpeg)

**1950S** As the original building in midtown Haifa had become too small, Prime Minister David Ben-Gurion selected a 300-acre site on Mount Carmel for a new campus. In 1953, the Institute began its move to Technion City on Mount Carmel. The Technion student body exceeded one thousand.

![](_page_51_Picture_5.jpeg)

### 1960s Reaching out with

**Wisdom,** Technion could now open its doors to hundreds of students from the developing countries of Africa and Asia. Scores of Technion faculty members provided technological assistance to countries worldwide, often under the auspices of United Nations agencies.

![](_page_51_Picture_8.jpeg)

![](_page_51_Picture_9.jpeg)

# 1967 with the unification of Jerusalem after the Six Day War, Technion skills were in high demand.

By now, Technion experts knew that to make a vision hold, you need to fortify it with skill and application. Here, Technion experts help fortify Judaism's most sacred site: the newly reclaimed Western Wall or Kotel in Jerusalem.

**1970S Heal the world** The opening of the faculty of medicine in 1969 meant that Technion became home to one of the few medical schools worldwide to be affiliated with an institute of technology. The embryonic power of Technion's future impact on world medical technology, biotechnology and life sciences could already be felt.

![](_page_51_Picture_13.jpeg)

![](_page_51_Picture_14.jpeg)

**1980S The digital revolution** From the birth of fiber-optics and the development of optoelectronics, Technion graduates were seen to be at the local forefront of technological innovation. Technion's Faculties of Computer Science and Electrical Engineering – ranked among the world's best – would lead the way in the high-tech revolution.

# 1990s

![](_page_52_Picture_1.jpeg)

**Incoming brainpower** after the collapse of the Soviet Union in the early 1990s, the student population rose dramatically from 9,000 to 10,500. Technion established technological incubator companies and structures to ensure that the talent of incoming scientists could be put to use.

**Students in Space** in 1998, Technion's Asher Space Research Institute (ASRI) successfully launched the "Gurwin TechSat II" microsatellite, making Technion one of five universities worldwide with a student program that designs, builds, and launches its own satellite.

![](_page_52_Picture_4.jpeg)

**Meta Faculties** Pioneering multidisciplinary science, Technion was first to establish a new paradigm of education – through the Russell Berrie Nanotechnology Institute (RBNI), the Grand Technion Energy Program (GTEP) and the Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering. *Pictured: Nano Bible - the world's smallest bible.* 

![](_page_52_Picture_6.jpeg)

# 2012 Cornerstone Centennial

Technion is home to three Nobel Laureates (l-r): Prof. Dan Shechtman (Chemistry 2011), Prof. Avram Hershko and Prof. Aaron Ciechanover (Chemistry 2004).

With its Ivy League partner Cornell University, Technion is to bring its penchant for manifesting vision to the world stage, with the foundation of the Technion-Cornell Innovation Institute (TCII) in New York City.

![](_page_52_Picture_10.jpeg)

![](_page_52_Picture_11.jpeg)

![](_page_52_Picture_12.jpeg)

### **From Generation** to Generation

A tribute to those who have led the institute throughout the decades, from the struggle of its foundation, through its expansion and vision.

![](_page_53_Picture_2.jpeg)

![](_page_53_Picture_3.jpeg)

![](_page_53_Picture_4.jpeg)

![](_page_53_Picture_5.jpeg)

![](_page_53_Picture_6.jpeg)

Prof. Aharon Tcherniavsky

![](_page_53_Picture_8.jpeg)

'30-'31

Arthur Blok, Principal

'31-'50

Eng. Max Hecker

Shmuel Pewsner

![](_page_53_Picture_12.jpeg)

![](_page_53_Picture_13.jpeg)

'51-'65

'65-'73

![](_page_53_Picture_17.jpeg)

Alexander Goldberg

![](_page_53_Picture_19.jpeg)

Amos Horev

2001-2009

Prof. Yitzhak Apeloig

![](_page_53_Picture_21.jpeg)

Prof. Josef Singer

![](_page_53_Picture_24.jpeg)

Prof. Peretz Lavie

![](_page_53_Picture_26.jpeg)

Dr Shlomo

Kaplansky

Dr Max Reis

![](_page_53_Picture_28.jpeg)

Prof. Zehev Tadmor

![](_page_53_Picture_30.jpeg)

Maj. Gen. (res.) Amos Lapidot

'73-'82

![](_page_53_Picture_33.jpeg)

![](_page_53_Picture_34.jpeg)

![](_page_53_Picture_35.jpeg)

Maj. Gen. (res.)

![](_page_53_Picture_37.jpeg)

![](_page_53_Picture_38.jpeg)

![](_page_53_Picture_39.jpeg)

Lt. Gen. (res.) Yaakov Dori

#### DOCTOR OF SCIENCE IN TECHNOLOGY

Dr William Fondiller, 1949 Dr Shlomo Kaplansky, 1950 Prof. Theodore Von Karman, 1951 P. F. Danel, 1952 Sir Ben Lockspeiser, 1952 Dr Walter C. Lowdermilk, 1952 Dr L. A. Richards, 1952 Dr Chaim Weizmann, 1952 Sir Patrick Abercrombie 1953 Dr Albert Einstein, 1953 R. J. Forbes, 1953 Dr J. Franck, 1953 George Sarton, 1953 Prof. Karl Taylor Compton, 1954 Prof. E. D. Bergman, 1955 J. W. Wunsch, 1955 Dr F. Julius Fohs, 1957 Dr Emanuel Goldberg, 1957 M. Novomeysky, 1957 Gerard Swope, 1957 Abraham Tulin, 1957 Simha Blass, 1958 Haim Slavin, 1958 Robert Lirmit, 1960 Dr Philip Sporn, 1960 David Rose, 1961 J. R. Sensibar, 1963 Edward E. Rosen, 1966 Gen. Yaakov Dori, 1967 Manes Pratt, 1968 Al Schwimmer, 1968 Harry F. Fischbach, 1971 Julius Silver 1971 Aharon Weiner, 1971 Arthur Blok 1972 Alexander Goldberg, 1975 David Laskov, 1975 Bern Dibner, 1976 Uzia Galil, 1977 Bernard M. Bloomfield, 1978 Maurice M. Rosen, 1978 Prof. Morris Cohen, 1979 Col. Jehiel R. Elyachar, 1979 Bruce Rappaport, 1979 Dr Nicholas J. Hoff, 1980 Justice Moshe Landau, 1980 Michael Sobol, 1980 Jacob W. Ullmann, 1980 Isin Ivanier, 1981 Dr Avraham Suhami, 1981 Dr Duncan Davies, 1982 Samuel Neaman, 1982 Sir Evelyn de Rothschild, 1982 Gen. Dan Tolkowsky, 1982 Michael Kennedy Leigh, 1983 Henry Taub, 1983 Gen. (Res.) Amos Horev, 1984 Frank R. Lautenberg, 1984 Eric Lidow, 1984 Joseph Szydlowski, 1984 Efraim R. Arazi, 1985

David J. Azrieli, 1985 Martin Kellner, 1985 Shimon Peres MK, 1985 Michael Schor, 1985 Moshe Arens MK, 1986 Sidney Corob, 1986 Norman Seiden, 1986 Eugene Stearns, 1986 Joan Goldberg Arbuse, 1987 President Chaim Herzog, 1987 Israel Libertovsky, 1987 Arie Carasso, 1988 Ludwig Jesselson, 1988 Louis B. Rogow, 1988 Prof. Emeritus Rachel Shalon, 1988 Yekutiel Federmann, 1989 Joseph Gruss, 1989 Homer Harvey, 1989 Harry Oppenheimer, 1989 Maximilian Schlomiuk, 1989 Prime Minister Margaret Thatcher, 1989 Laurence A. Tisch, 1989 Neri J. Bloomfield, 1990 Edward R. Goldberg, 1990 Eli Hurwitz, 1990 Yitzhak Rabin MK, 1990 Walter H. Annenberg, 1991 Miriam Benjamin, 1991 Prof. Malcolm Chaikin, 1991 Max Dresher, 1991 Max M. Fisher, 1991 Benno Gitter, 1991 Gustave Leven, 1991 Erik Blumenfeld, 1992 Sydney C. Cooper, 1992 François Leotard, 1992 George P. Shultz, 1992 Sam B. Topf, 1992 Stef Wertheimer, 1992 Louis Benjamin, 1993 Israel Pollack, 1993 Elizabeth Corob, 1993 Max Shein, 1993 Ben Winters, 1993 Dr Joseph N. Epel, 1994 Emmanuel Gill, 1994 Teddy Kollek, 1994 Dr A. I. (Ed) Mlavsky, 1994 Leonard H. Sherman, 1994 Dr Dov Frohman, 1995 Dov Lautman, 1995 Sanford Kaplan, 1995 Dr J. Fraser Mustard, 1995 Lord Leonard Wolfson, 1995

#### HONORARY DOCTOR

Lester Crown, 1996 Gen. (Res.) David lvry, 1996 Ramie Silbert, 1996 Prof.Heinrich Peter Klaus Ursprung, 1996 Lewis Weston, 1996 Winston S. Churchill, 1997 Dr Lillian Chutick, 1997

Dr George H. Heilmeier, 1997 Etia Meilichson, 1997 Dr Felix Zandman, 1997 Frederick R. Adler, 1998 Ted Arison, 1998 Justice Aharon Barak, 1998 Dr Christian Hodler, 1998 Hershel Rich, 1998 Arthur Gilbert, 1999 William Lester, 1999 Robert Neter 1999 Dan Propper, 1999 Leon Y. Recanati, 1999 Arnold Recht, 1999 Ben Sosewitz, 1999 Dr Irwin M. Jacobs, 2000 Moshe Keret 2000 Prof. Benno Müller-Hill, 2000 Dr Johannes Rau, 2000 Barrie Rose, 2000 Harry J. Stern, 2000 7vi 7ilker 2000 Marshall Butler, 2001 Theodore H. Krengel, 2001 Dr Dan Maydan, 2001 Peter Munk, 2001 Irving A. Shepard, 2001 Yehuda Zisapel, 2001 Zohar Zisapel, 2001 Frances Brody, 2002 Rava Gensler, 2002 Sidney Konigsberg, 2002 Alexandre Mallat, 2002 Avraham B. Shochat, 2002 Ing. Paul S. Arieli (Goldschmidt), 2003 Israel Feldman, 2003 Ing. Isaac (Eddie) Streifler-Shavit, 2003 Stanley Zielony, 2003 Dr Zeev Bonen, 2004 Joseph Gurwin, 2004 Lawrence S. Jackier, 2004 Philip E. Klein, 2004 Benny Landa, 2004 Dr Bernard Sherman, 2004 Gil Shwed, 2004 Norman Belmonte, 2005 Edith Fischer, 2005 Hubert Leven, 2005 Alfred E. Mann, 2005 Rachel Pollak, 2005 Prof. Elie Wiesel, 2005 Gen. (Res.) Avihu Ben-Nun, 2006 Evelyn Berger, 2006 Shlomo Nehama, 2006 Prof. Amnon Pazy, 2006 Lois Peltz, 2006 Stanley Shirvan, 2006 Scott Black, 2007 Lucien Bronicki, 2007 Yehudit Bronicki, 2007 Robert A. Davidow, 2007 Lorry I. Lokey, 2007 Seymour Schulich, 2007

Joseph Tanenbaum, 2007 Angelica Berrie, 2008 Stanley Chais, 2008 Thomas L. Friedman, 2008 Avinoam Naor (Aharonovich), 2008 Jonathan Sohnis, 2008 Joseph Ackerman, 2009 Zahava Bar-Nir, 2009 Reinhard Frank, 2009 Dani Karavan, 2009 Dr Stephen A. Laser, 2009 David Polak, 2009 Dr Yossi Vardi 2009 Elie Alalouf, 2010 Stephen Grand, 2010 Michael Heller, 2010 Galia Maor, 2010 Dr Hyman Mitchner, 2010 Gen (Res) Amram Mitzna, 2010 Ruth Leventhal Nathanson, 2010 Prof. Alain Aspect, 2011 Edith Cresson, 2011 Dr Moshe Epstein, 2011 Alan Forman, 2011 Mark Gelfand, 2011 Prof. Solomon W. Golomb, 2011 D. Dan Kahn, 2011 Prof. Thomas Kailath, 2011 Yaacov Kotlicki, 2011 Eitan Wertheimer, 2011

#### DOCTOR OF SCIENCE

Dr Niels Bohr, 1958 Dr Caroll V. Newsom, 1958 Dr F. Houphouet-Biogny, 1962 Dr Harold C. Urey, 1962 Dr I. I. Rabi, 1963 Dr A. Biram, 1965 Dr Yuval Ne'eman, 1966 Dr Selman A. Waksman, 1966 Dr Robert B. Woodward, 1966 Lord Rothschild, 1968 Dr Sydney Goldstein, 1969 Dr Eugene Paul Wigner, 1971 Dr M. Schiffer, 1972 Dr J. Wolfowitz, 1972 Dr George B. Dantzig, 1973 Dr Herman F. Mark, 1975 Dr Laurence R. Klein, 1982 Prof. Frank A. Cotton, 1983 Prof. Daniel Drucker, 1983 Prof. Beno Eckmann, 1983 Prof. Paul Erdos, 1983 Prof. Alfred Kastler, 1983 Prof. Ephraim Katzir, 1983 Prof. Herman Chernoff, 1984 Prof. Gilbert F. Froment, 1984 Prof. Eli Sternberg, 1984 Prof. Robert Hofstadter, 1985 Prof. Samuel Karlin, 1985 Prof. Ascher H. Shapiro, 1985 Prof. Anatole de Abragam, 1986

Dr Alan Hoffman, 1986 Prof. Simon Ostrach, 1986 Dr Arno A Penzias 1986 Prof. Louis D. Smullin, 1986 Dr Jacob M. Geist, 1987 Prof. Jacob Willem Cohen, 1988 Prof. Alberto P. Calderon, 1989 Prof. Richard M. Karp, 1989 Prof. Sir Aaron Klug, F.R.S., 1989 Prof. Werner Stumm, 1989 Prof. Victor F. Weisskopf, 1989 Prof. Rosalyn Sussman Yalow, 1989 Prof. Jack D. Dunitz, 1990 Prof. Felix J. Weinberg, 1990 Prof. Bruno Zevi, 1990 Prof. Jose Goldemberg, 1991 Prof. Michel Jouvet, 1991 Prof. Marcus Karel. 1991 Prof. Rolf W. Landauer, 1991 Prof. Seymour Rabinowitz, 1991 Prof. Yakir Aharonov, 1992 Prof. David Bohm, 1992 Prof. Angelo Miele, 1992 Dr Shmuel Winograd, 1992 Prof. R. Byron Bird, 1993 Prof. Peter Haasen, 1993 Prof. Harold A. Scheraga, 1993 Prof. Israel Dostrovsky, 1994 Prof. Mildred S. Dresselhaus, 1994 Prof. Richard Goldstein, 1994 Dr Donna Shalala, 1994 Prof. Joan S. Lyttle Birman, 1995 Prof. Bernard Budiansky, 1995 Prof. Karl Ludwig Kompa, 1995

#### HONORARY DOCTOR OF SCIENCE

Prof. Roald Hoffmann, 1996 Prof. Robert E. Lucas, Jr., 1996 Prof. Robert S. Langer, 1997 Prof. Barry M. Trost, 1997 Prof. Haim Brezis, 1998 Prof. Rudolph A. Marcus, 1998 Dr Joel Birnbaum, 1999 Prof. Barry Simon, 1999 Prof. Arnold L. Demain, 2000 Prof. Helmut Schwarz, 2000 Dr Andrew J. Viterbi, 2000 Dr Richard A. Lerner, 2001 Dr Lester C. Thurow, 2001 Dr Carl de Boor 2002 Dr Solomon H. Snyder, 2002 Prof. Alexandre Joel Chorin, 2003 Dr Santiago Calatrava, 2004 Prof. Azriel Rosenfeld, 2004 Prof. Richard E. Smalley, 2004 Dr Bernard Gordon, 2005 Prof. Joshua Jortner, 2005 Prof. James R. Rice, 2005

Dr Henry Samueli, 2005 Prof. Sir Michael V. Berry, 2006 Prof. Graham C. Goodwin, 2006 Prof. Thomas L. Magnanti, 2007 Prof. Nam Pyo Suh, 2007 Prof. Israel Gohberg, 2008 Architect Daniel Libeskind, 2008 Dr Igor Dawid, 2009 Prof. Jean Marie Lehn, 2009 Prof. Jean Marie Lehn, 2009 Prof. Jean Marie Lehn, 2010 Prof. Anders Lindquist, 2010 Prof. Lev Pitaevskii, 2010

#### DOCTOR OF ARCHITECTURE

David Ben Gurion, 1962

#### HONORARY ENGINEER Joseph W. Wunsch, 1946

Alexander Konoff, 1949 Elias Fife, 1955

#### HONORARY FELLOW

Col. Jehiel R. Elvachar, 1953 Arthur Blok, 1954 Max Hecker 1954 Sir Louis Sterling, 1956 Sir Isaac Wolfson, 1956 Samuel Fryer, 1959 S. J. Birn, 1965 Dr Jacob Isler, 1970 Ing. Aharon Goldstein, 1971 Leo M. Harvey, 1972 Maurice M. Rosen, 1972 Barnett Shine, 1972 Jacob W. Ullmann, 1972 Alexander Whyte, 1972 Abel Wolman, 1972 Jacobs K. Javits, 1973 Ludwig Jesselson, 1973 Eliyahu Sacharov, 1973 Victor Tabah, 1973 Samuel M. Bernstein, 1975 Horace W. Goldsmith, 1975 Alexander Hassan, 1975 Michael Kennedy Leigh, 1975 Gen. Dan Tolkowsky, 1975 Arie Carasso, 1976 Avraham Lev, 1976 Leon Lidow 1976 Joseph Riesman, 1976 Eugene Stearns, 1976 Nathan Goldberg, 1977 Lawrence Harvey, 1977 Nate Sherman, 1977 Isaac Tavlor, 1977 Yekutiel Federmann, 1978 Aaron Gutwirth, 1978

Rose Herrmann, 1978 Max Shein, 1978 Moshe Bernard Gitter, 1979 Josef Gruenblat, 1979 Louis L. Lockshin, 1979 Norman Seiden, 1979 L. Shirley Tark, 1979 Anatol Josepho, 1980 Pearl Milch, 1980 Louis Susman, 1980 Henry Taub, 1980 Solm Yach, 1980 Morley Blankstein, 1981 Eedis Cooperband, 1981 Ing. Zvi Langer, 1981 Justice Roy Matas, 1981 Joan Goldberg Arbuse, 1982 Stephen Berger, 1982 Ernest Nathan, 1982 Seniel Ostrow 1982 Uriel Shalon, 1982 Beatrice Sherman, 1982 Louis Stein, 1982 Jack Chisvin, 1983 Reginald Coleman-Cohen, 1983 Anna Tulin Elyachar, 1983 Louis Bernard Magil 1983 Mark Moshevicz, 1983 Louis Rogow, 1983 Alf Schwarcbaum, 1983 Sam Topf, 1983 Frances Cohen, 1984 Nathan Kirsch, 1984 Theodore Krengel, 1984 Joan Callner Miller, 1984 Judge Leonard Rabinowitz, 1984 Stefanie Sonia Schreier, 1984 David Silbert 1984 Irma Wigdor, 1984 Shlomo Zabledowitz, 1984 Max Dresher, 1985 Ruben Finkelstein, 1985 Salomon Gottesfeld, 1985 Joseph H. Jackier, 1985 Martin Jelin, 1985 Ing. Gen. Robert Munnich, 1985 Sarah Baruchin, 1986 Louis Benjamin, 1986 Miriam Benjamin, 1986 Maurice Commanday, 1986 Salman Grand, 1986 Eugene N. Riesman, 1986 Henri Strosberg, 1986 Dr Joseph N. Epel, 1987 Burt I. Harris, 1987 Leonard H. Sherman, 1987 Lewis M. Weston, 1987 Carl Alpert, 1988 Alexander Coler, 1988

Sydney Cooper, 1988 Louis Harris, 1988 Abba Kramer, 1988 Dr Zalman M. Shapiro, 1988 Irving A. Shepard, 1988 Ramie Silbert, 1988 Chaim M. Gringlas, 1989 Shmuel Kantor, 1989 Andre Molleson, 1989 Monte Monaster, 1989 Albert Newman, 1989 Harry Sheres, 1989 Harold M. Stone, 1989 Ing. Isaac (Eddie) Streifler Shavit, 1989 Sidney Wolberg, 1989 Yosef Ami, 1990 Albert Ben-David, 1990 Irving Greenberg, 1990 Emanuel Shachar, 1990 Ben Sosewitz, 1990 Helen Asher, 1991 Franklin G. Bishop, 1991 Helene Blanc, 1991 Melvin Dubin, 1991 Joseph K. Even, 1991 Benjamin Fohrman, 1991 Benjamin Free, 1991 Dr Albert A. Kaufman, 1991 Reuben Kunin, 1991 Adelaide Kennedy Leigh, 1991 William Lester, 1991 Edmundo Safdie, 1991 Irving Wenger, 1991 Ben Winters, 1991 Itzhak Bar-Nov, 1992 Frances Brody, 1992 Israel Feldman, 1992 Nathan Max Goldman 1992 Richard Aaron Koplow, 1992 Yeshavahu Landau, 1992 Albert Nerken, 1992 Hershel Rich, 1992 Dorothy Schussheim, 1992 Roma Broida Wittcoff, 1992 Samuel Zabner, 1992 Ela Rousso de Blasbalg, 1993 Melvvn H. Bloom, 1993 Paul Chanin, 1993 Zvi Dvoresky, 1993 Jerry Friedman, 1993 Dr Stephen Shapiro, 1993 Gerald Silbert, 1993 Peter Simon, 1993 Harry Stern, 1993 Clément Vaturi, 1993 Marshall Butler, 1994 Raya Gensler, 1994 Dipl. Ing. Helmut Gutmann, 1994 Tess Heffner, 1994

Dr Christian Hodler, 1994 Daniel Karp, 1994 Trudy Louis, 1994 Arnold Recht, 1994 Yona Uspiz, 1994 Dr Kenneth Alberman, 1995 Alfred Bar, 1995 Moshe Bar-Ilan, 1995 Louis Edelstein, 1995 Alex J. Etkin, 1995 Prof. Asger Lindegaard-Andersen, 1995 Richard Swig, 1995 Joseph Gurwin, 1996 William Marcus, 1996 Yehezkel Nussbaum, 1996 Norton Sherman, 1996 Harry J. Stern, 1996 Mary Werksman, 1996 Dan Wind, 1996 Norman Belmonte, 1997 Robert Davidow, 1997 Rudolph Forchheimer, 1997 Charles Housen, 1997 Ivoncy loschpe, 1997 Sidney Konigsberg, 1997 Alexandre Mallat, 1997 Norbert M. Rand, 1997 Gyora Rubinstein, 1997 William Shamban, 1997 Dov Tirosh, 1997 K. B. Weissman, 1997 Joseph Freed, 1998 Tamara Handelsman, 1998 Philip E. Klein, 1998 Samuel Geltman, 1998 Dr Arthur Wein, 1998 Elisha Yanay, 1998 Scott Black 1999 Milford Bohm, 1999 Simcha Cohen-Stern, 1999 Jerome Drexler, 1999 Dorothy Kellner, 1999 Stanley Shirvan, 1999 Haim Stoessel, 1999 Benjamin B. Torchinsky, 1999 Jack Bellock, 2000 Michael Frieze, 2000 Doreen Green, 2000 Marguerite Greenberg, 2000 Lawrence Jackier, 2000 Lois Peltz 2000 Miriam Pushkar, 2000 Joseph Tanenbaum, 2000 Evelyn Berger, 2001 David Dibner, 2001 Edith Fischer, 2001 David Friedman 2001 Ruth Hoenich, 2001 Prof. Eliahu I. Jury, 2001

Prof. Burkhart Müller, 2001 David Polak, 2001 Ionathan Sohnis 2001 Stanley Chais, 2002 Prof. Dr Ing. Ulrich Draugelates, 2002 Michael Heller, 2002 Frank G. Meyer, 2002 Morris Rochlin, 2002 Fli Welt 2002 Brig. Gen. (Res.) Yitzhak Ben Dov, 2003 Hans Cohn, 2003 Dr Stephen A. Laser, 2003 Dr Hyman Mitchner, 2003 Col. Yitzhak Turgeman, 2003 Zahava Bar-Nir, 2004 Dahlia Blech, 2004 David Brecher, 2004 Benjamin Carasso, 2004 Aaron Etra, 2004 Reinhard Frank, 2004 Herbert W. Pollack, 2004 Nina Sabban, 2004 Jeannette Dankner, 2005 Alan Forman, 2005 Gary Goldberg, 2005 Shmuel Rotem, 2005 Joan Seidel, 2005 Esther Smidof, 2005 Dan Vilenski, 2005 William Wiener, 2005 Dr Isaac Dvoretzky, 2006 Coleman Kenneth Greidinger, 2006 Ing. Shaul Ivtsan, 2006 D. Dan Kahn, 2006 Yaacov Kotlicki, 2006 Prof. Jacques Lewiner, 2006 Hal Marcus, 2006 Jack Skodnek, 2006 Dr Coleman Caplovitz, 2007 Macabi Carasso, 2007 Yoel Carasso, 2007 Irwin L. Gross, 2007 Ruth Leventhal Nathanson, 2007 Janey Sweet, 2007 Reuven Agassi, 2008 Gen. (Res.) Shlomo Burstein-Inbar, 2008 J. Steven Emerson, 2008 Mark Gelfand, 2008 Leon Kempler OAM, 2008 Cindy Sipkin, 2008 Mariane Szego, 2008 Sandor Szego, 2008 Victor Asser. 2009 Ilse Blumenfeld, 2009 André Deloro, 2009 Carol B. Epstein, 2009 Sandy Hittman, 2009 Scott Leemaster, 2009 Tzvi Neta, 2009

Bennett Rechler, 2009 Hannah Rechler Rabinowitz, 2009 Chaim Yaron, 2009 Giora Ackerstein, 2010 Michael Fuerst, 2010 Aviva Goldberg, 2010 Ben-Ami Gov, 2010 Michael Klein, 2010 Charles Levin, 2010 Howard Rosenbloom, 2010 Joel Rothman, 2010 Ivan Stern, 2010 Fausta Finzi Carli, 2011 Oscar Davis 2011 Dr Harry Handelsman, 2011 Sidney Lejfer, 2011 Ed Satell, 2011 Rafael Sirkis, 2011 Stanley Sussman, 2011 Albert Sweet, 2011

#### HARVEY PRIZE

Prof. Willem J. Kolf. 1972 Prof. Claude E. Shannon, 1972 Sir Alan Howard Cottrell, 1974 Prof. Gershom Scholem, 1974 Prof. George Klein, 1975 Prof. Edward Teller, 1975 Prof. Saul Lieberman, 1976 Prof. Herman F. Mark, 1976 Prof. Seymour Benzer, 1977 Prof. Freeman John Dyson, 1977 Prof. Bernard Lewis, 1978 Prof. Isaak Wahl, 1978 Prof. Shlomo Dov Goitein, 1980 Prof. Michael Rabin, 1980 Prof. Ephraim Racker, 1980 Sir James Lighthill, 1981 Prof. Hans W. Kosterlitz, 1981 Prof. Jacob Polotsky, 1982 Prof. Alvin Weinberg, 1982 Prof. Robert Aumann, 1983 Prof. Philip Leder, 1983 Prof. Franz Rosenthal, 1984 Dr Peter Sorokin, 1984 Prof. George B. Dantzig, 1985 Prof. Barnett Rosenberg, 1985 Prof. Paul C. Lauterbur, 1986 Prof. Benjamin Mazar, 1986 Prof. Sydney Brenner, 1987 Prof. Pierre Chambon, 1987 Prof. Pierre-Gilles de-Gennes, 1988 Dr Benoit B. Mandelbrot, 1989 Dr Robert H. Dennard, 1990 Prof. Jacques-Louis Lions, 1991 Prof. Bert Sakmann, 1991 Mikhail Gorbachev, 1992 Prof. Amnon Yariv, 1992

Prof. Hillel Furstenberg, 1993 Prof. Eric Kandel, 1993 Prof. Richard Zare, 1993 Prof. Vladimir I. Arnold, 1994 Prof. Robert A. Weinberg, 1994 Dr John Cahn, 1995 Dr Donald Knuth, 1995 Prof. Claude Cohen-Tannoudji, 1996 Prof. C. Walton Lillehei, 1996 Prof. Roger D. Kornberg, 1997 Prof. Richard Karp, 1998 Prof. Barry Sharpless, 1998 Prof. Elizabeth H. Blackburn, 1999 Prof. Robert G. Gallager, 1999 Prof. Harry B. Gray, 2000 Prof. David J. Gross, 2000 Prof. James E. Peebles, 2001 Prof. Bert Vogelstein, 2001 Prof. Peter B. Dervan, 2002 Prof. Ada E. Yonath, 2002 Prof. Robert Langer, 2003 Dr Arthur Ashkin, 2004 Prof. Wavne A. Hendrickson, 2004 Prof. Wolfgang P. Baumeister, 2005 Prof. Edward Witten, 2005 Prof. Charles L. Bennett, 2006 Prof. Ronald M. Evans, 2006 Prof. Michael Graetzel, 2007 Prof. Stephen E. Harris, 2007 Dr Charles H. Bennett, 2008 Prof. David Eisenberg, 2008 Prof. Sir David Baulcombe, 2009 Prof. Shuji Nakamura, 2009 Prof. Michael Karin, 2010 Prof. Alexander M. Polyakov, 2010 Prof. Sir Richard Friend, 2011 Prof. Judea Pearl, 2011

#### **TECHNION MEDAL**

Justice Moshe Landau, 1996 Gen. (Res.) Amos Horev, 1996 Uzia Galil, 1997 Samuel Neaman, 1997 Bruce Rappaport, 1998 Haim Rubin, 1998 Horry Taub, 1998 Norman Seiden, 2001 Martin Kellner, 2005 Leonard Sherman, 2005 Ben Sosewitz, 2008 Lewis Weston, 2008

![](_page_57_Picture_0.jpeg)

HONORARY CHAIR Uzia Galil, Israel \*

CHAIR Lawrence Jackier, USA \*

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MAYOR OF HAIFA Yona Yahav

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Doreen Green, Canada Daniel Gutenberg, Switzerland Gen. (Res.) Shalom Hagai, Israel Gad Haker, Israel Louis N. Harris, UK Michael Heller, UK Morven Heller, UK Sandi Hittman, USA Gen. (Res.) Itzhak Hoffi, Israel Maj. Gen.(Res.) Shlomo (Burstein) Inbar Israel Gen. (Res.) David Ivry, Israel Ing. Shaul Ivtsan, Israel \* Dr Irwin Jacobs, USA Gershon Kaddar, Israel Dr Shlomo Kalish, Israel Miri Katz. Israel Theodore Kenny, Israel Avi Kerbs, Israel Moshe Keret, Israel Dr Joachim Klein, Germany Yaacov Kotlicki, Israel Kobi Kurtz, Netherlands Benny Landa, Israel Yeshayahu Landau, Israel Maj. Gen. (Res.) Amos Lapidot, Israel Dr Stephen Laser, USA Eliaz Lavi, Israe Ron Lazarovits, Australia Sidney Lejfer, USA Isaac-Sakis Leon, Greece Charles Levin, USA Dr Daphna Levy, Israel Prof. Jacques Lewiner, France Moshe Lichtman Israel Prof. Anders Lindquist, Sweden Lorry I. Lokey, USA Rene Luks, Switzerland Dr Yoelle Maarek, Israel Israel Makov, Israel Prof. Fadel Mansour, Israel \* Dana Maor, Israel Joshua Maor, Israel Hal Marcus, USA Shlomo Markel, Israel \* Gurion Meltzer, Israel Giora Meyuhas, Israel Raphael Mishan, USA Dr Hyman Mitchner, USA Jonathan Moller, USA Avinoam Naor, Israel Ruth Leventhal Nathanson, USA Shlomo Nehama, Israel Meir Nissensohn, Israel Dr Eli Opper, Israel Dr Edgar Paltzer, Switzerland Daniel Peltz, UK Lois Peltz, UK David Perlmutter, Israel Prof. Guilherme Ary Plonski, Brazil David Polak, USA Rachel Pollak, Israel Rina Pridor, Israel \* Dan Propper, Israel Clifford Rand, Canada Irith Rappaport, Israel Dr Ruth Ratner, Australia Dr Jacob Razon, Israel \*

Leon Recanati, Israel Bennett Rechler, USA Arnold Recht, Canada Dr Max W. Reis, Israel Shlomo Reisman, Israel Prof. Dr Gerd-Volker Roeschenthaler, Germany Howard Rosenbloom, USA Shmuel Rotem, Israel \* Joel S. Rothman, USA Henri Rothschild, Canada Haim Rousso, Israel Kobi Rozengarten, Israel Nina Sabban, USA Edmundo Safdie, Brazil Prof. Dr Thomas Scheper, Germany Shoshana Schreiber, Israel Yigal Schreiber, Israel Arie Scope, Israel Dr Yoram Sebba, Israel \* Arnold Seidel, USA Joan Seidel, USA Yair Shamir, Israel Maurice Shashoua, Brazil Raphi Shavit, Israel Irving A. Shepard, USA Leonard H. Sherman, USA Stanley Shirvan, USA Abraham Shochat, Israel Rafael Sirkis, Israel Jonathan Sohnis, USA Simcha Stern, Israel Justice (Ret.) Tova Strassberg-Cohen, Israel Ing. Isaac Eddie Streifler-Shavit, Israel \* Stanley Sussman, USA Ing. Sandor Szego, Brazil Prof. Zehev Tadmor, Israel Joseph Tanenbaum, USA Gen. (Res.) Dan Tolkowsky, Israel Gideon Tolkowsky, Israel Itzhak Turgeman, Israel Oded Tyrah, Israel Dr Yossi Vardi, Israel Dan Vilenski, Israel Dr Andrew Viterbi, USA Dr Kobi Vortman, Israel Eyal Waldman, Israel Prof. Dr Peter Weinberger, Austria Eitan Wertheimer, Israel Stef Wertheimer, Israel Lewis M. Weston, USA Avigdor Willenz, Israel Laura Wolfson-Townsley, UK Ben Wygodny, Canada Danny Yamin, Israel \* Shlomo Yanai, Israel Elisha Yanay, Israel Chaim Yaron, Israel \* Giora Yaron, Israel Yehuda Zisapel, Israel Zohar Zisapel, Israel

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ALUMNI ASSOCIATION Eyal Kaplan

Dr Ilana Maor

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SENIOR LECTURERS Dr Oren Kurland

TEACHING STAFF UNION Liad Levy

PROFESSORS EMERITI Prof. Amos Komornik

FACULTY ASSOCIATION Prof. Irad Yavneh

ORGANIZATION OF PRACTICAL ENGINEERS (HANDESSAIM) Naftali Blau

THE M4 ORGANIZATION: THE ACADEMIC EMPLOYEES UNION AT THE TECHNION Moshe Barak

UNION OF THE ADMINISTRATIVE WORKERS AT TECHNION Vardit Friedmann

ORGANIZATION OF TECHNION PENSIONERS Abraham Benmaman

GRADUATE STUDENTS ORGANIZATION Moshe Apel Schachar Raz

STUDENTS ASSOCIATION Masha Friedman Assaf Zinger

![](_page_59_Figure_1.jpeg)

NUMBER OF STUDENTS 2011/2012

\* including 559 MD 4th-6th year students, 103 of whom are on the Technion American Medical School Program

\*\* including 117 MBA students

**TOTAL: 2,728** 

MSc 699

\*\*\* including graduate students in Autonomous Systems & Robotics; Biotechnology; Design & Manufacturing Engineering; Energy; Polymer Engineering; Nanoscience & Nanotechnology; and Systems Engineering

#### **Degrees Awarded (Graduates)** Total Degrees Awarded (1924-2012) Degrees Awarded 2012 2011 2012 MD 115 PhD BA/BSc 71,451 Bachelor's 1,789 1,729 185 MD 2,101 MD 115 115 17,880 Master's 741 699 Master's 4,389 PhD PhD 189 185 BSc 1,729 TOTAL TOTAL 95,821 2,834 2,728 TOTAL STUDENT POPULATION

|            | 2008   | 2009   | 2010   | 2011   | 2012   |
|------------|--------|--------|--------|--------|--------|
| Bachelor's | 8,521  | 9,278  | 9,401  | 9,564  | 9,529  |
| Master's   | 2,362  | 2,290  | 2,301  | 2,351  | 2,384  |
| Doctorate  | 881    | 877    | 963    | 934    | 943    |
| Total      | 12,314 | 12,445 | 12,665 | 12,849 | 12,856 |

All data correct to May 20, 2012

#### OPERATING BUDGET

October I, 2011 - September 30, 2012

|                       | Thousands |        |
|-----------------------|-----------|--------|
| INCOME                | of NIS    | %      |
| Government Allocation | 829,945   | 69.2   |
| Self Income           | 169,800   | 14.2   |
| Tuition Fees          | 109,000   | 9.1    |
| Technion Societies    | 46,000    | 3.8    |
| Deficit               | 44,847    | 3.7    |
| Total Income          | 1,199,592 | 100.00 |
| EXPENDITURE           |           |        |
| Staff Emoluments      | 658,875   | 54.9   |
| Pension Payments      | 211,985   | 17.7   |
| Operating Expenses    | 137,318   | 11.4   |
| Maintenance           | 97,936    | 8.2    |
| Student Aid           | 93,478    | 7.8    |
| Total Expenditure     | 1,199,592 | 100.00 |

#### S P O N S O R E D R E S E A R C H F R O M EXTERNAL SOURCES (Millions of \$US)

![](_page_60_Figure_6.jpeg)

#### FAST FACTS 2011/12

100 -89.3 86.8 82.6 80 -74 MILLIONS OF \$US 71 59.9 57.6 60 – 53.9 40 -20 -0\_ 2003/4 2004/5 2005/6 2006/7 2007/8 2008/9 2009/10 2010/11

FOUNDED: 1912 STUDENT POPULATION: 12,856 ACADEMIC DEPARTMENTS: 18 UNDERGRADUATE PROGRAMS: 50 GRADUATE PROGRAMS: 80 DEGREES AWARDED: 95,821 FACULTY: 616 TECHNICAL & ADMINISTRATIVE STAFF: I,I70 RESEARCH CENTERS: 52 BUILDINGS ON CAMPUS: 90 BUILT-UP AREA: 464,317m<sup>2</sup> DORMITORY BEDS: 4,442

#### DEVELOPMENT EXPENDITURE

![](_page_60_Figure_12.jpeg)

DEVELOPMENT

EXPENDITURE

October 1, 2010 - September 30, 2011

| The                                | ousands | Thousands |         |
|------------------------------------|---------|-----------|---------|
|                                    | of \$US | %         | NIS*    |
| Buildings, Renovations &           |         |           |         |
| Infrastructure                     | 18,569  | 46.4      | 70,561  |
| Multidisciplinary Research Centers | 12,516  | 31.2      | 46,433  |
| Laboratories & Equipment           | 8,978   | 22.4      | 32,822  |
| Total                              | 40,063  | 100.0     | 149,816 |
| * \$US1 = NIS 3.55                 |         |           |         |

#### TOTAL INCOME FROM TECHNION SOCIETIES

![](_page_61_Picture_1.jpeg)

Lawrence Jackier Chairman of the Board of Governors

![](_page_61_Picture_3.jpeg)

**Prof. Moshe Sidi** Executive Vice President for Academic Affairs

TECHNION DEANS Dean of Undergraduate Studies Prof. Daoud Bshouty

Dean of the Jacobs Graduate School **Prof. Hillel Pratt** 

Dean of Division of Continuing Education and External Studies **Prof. Yehudit Dori** 

Dean of Students Prof. Michal Green

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Faculty of Architecture and Town Planning **Prof. Yehuda Kalay** 

Faculty of Biology Prof. Gad Schuster

Faculty of Biomedical Engineering Prof. Dan Adam

Faculty of Biotechnology and Food Engineering **Prof. Ben-Zion Levi** 

Wolfson Faculty of Chemical Engineering **Prof. Raphael Semiat** 

![](_page_61_Picture_15.jpeg)

Yoram Alster Chairman of the Council

![](_page_61_Picture_17.jpeg)

**Prof. Oded Shmueli** Executive Vice President for Research

Schulich Faculty of Chemistry Prof. Alon Hoffman

Faculty of Civil and Environmental Engineering **Prof. Noah Galil** 

Faculty of Computer Science Prof. Eli Biham

Department of Education in Technology and Science Assoc. Prof. Orit Hazzan

Faculty of Electrical Engineering Prof. Adam Shwartz

Department of Humanities and Arts **Prof. Charlotte Schapira** 

Davidson Faculty of Industrial Engineering and Management Prof. Aharon Ben-Tal

Faculty of Materials Engineering Prof. Wayne Kaplan

Faculty of Mathematics Prof. Jacob Rubinstein

Faculty of Mechanical Engineering Prof. Pinhas Bar-Yoseph

Rappaport Faculty of Medicine Prof. Eliezer Shalev

![](_page_61_Picture_30.jpeg)

Prof. Peretz Lavie President

![](_page_61_Picture_32.jpeg)

Dr Avital Stein Executive Vice President and Director General

![](_page_61_Picture_34.jpeg)

**Prof. Paul Feigin** Senior Executive Vice President

![](_page_61_Picture_36.jpeg)

**Prof. Boaz Golany** Vice President for External Relations and Resource Development

Faculty of Physics Prof. Noam Soker

Prof. Shimon Gepstein ADDITIONAL OFFICERS

Center for Pre-university Education

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Assistant to SVP for the Promotion of Teaching **Prof. Daniel Lewin** 

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Director, Assets and Investments Division **Yaron Eyal** 

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General Counsel Adv. Dror Goldstein

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Amos Yarom Faculty of Physics

#### **HOREV FELLOWS**

**Carmel Rotschild** Faculty of Mechanical Engineering

**AEROSPACE ENGINEERING** 

Amir Yehudavoff Faculty of Mathematics

**ELECTRICAL ENGINEERING** 

ARCHITECTURE AND **TOWN PLANNING** 

New Faculty Appointments

Efrat Eizenberg Lecturer

Yossef Elimelech

Research Associate

Michelle Portman Senior Lecturer

Els Verbakel Lecturer

BIOLOGY Ayelet Lamm Senior Lecturer

CHEMICAL ENGINEERING Viatcheslav Freger Associate Professor

CHEMISTRY Lilac Amirav Senior Lecturer

Galia Maayan Senior Lecturer

**CIVIL AND ENVIRONMENTAL** ENGINEERING **Oded Amir** Lecturer

Amir Degani Senior Lecturer

**Barak Fishbain** Senior Lecturer

**COMPUTER SCIENCE** Mirela Ben-Chen Senior Lecturer

Yuval Cassuto Senior Lecturer

Yoav Etsion Senior Lecturer

INDUSTRIAL ENGINEERING AND MANAGEMENT Ella Miron-Spektor Senior Lecturer

**Hovav Perets** Teaching Associate

**MATERIALS ENGINEERING** Yaron Amouyal Senior Lecturer

MATHEMATICS Nicholas Crawford Senior Lecturer

Uri Shapira Senior Lecturer

MECHANICAL ENGINEERING Moran Bercovici Senior Lecturer

Dan Mordehai Senior Lecturer

**Carmel Rotschild** Senior Lecturer

Yuli Starosvetsky Senior Lecturer

Shelly Tzlil Senior Lecturer MEDICINE Imad Abu El-Naaj Clinical Senior Lecturer

Ricardo Alfici Clinical Assoc. Professor

Avraham Avital Senior Lecturer

Alexander Becker Clinical Lecturer

Boaz Bloch Clinical Lecturer

David Blondheim Clinical Senior Lecturer

Noam Bor Clinical Lecturer

**Daniel Briscoe** Clinical Lecturer

Shemy Carasso Clinical Senior Lecturer

Dori Derdikman Senior Lecturer

Guy Dori Clinical Lecturer

Simon Duek Clinical Senior Lecturer

Dana Egozi Clinical Lecturer

Nael Elias Clinical Lecturer

ACADEMIC FACULTY 2012

**Regular Faculty \*** Individuals **Full Time Equivalents (FTEs)** Lecturer 18 14 Senior Lecturer 127 116 Associate Professor 230 211 **Full Professor** 240 241 Total\* 581 616 **Clinical Track Appointments** 241 95 **External Adjuncts** 935 224

\*Including medical faculty

Danny Eytan Lecturer

Aharon Frimerman Clinical Senior Lecturer

**Doron Garfinkel** 

Clinical Senior Lecturer Yaniv Gelernter Clinical Lecturer

Mordechai Grupper Clinical Lecturer

**Riad Haddad** Clinical Senior Lecturer

Emilia Hardak Clinical Lecturer

**Ruth Hershberg** Senior Lecturer

Yuval Kaufman Clinical Lecturer

Adi Klein-Kremer Clinical Lecturer

Anatoly Kreinin Clinical Lecturer

Arie Lissak Clinical Senior Lecturer

Beth Brianna Murinson Clinical Assoc. Professor

Aviram Netzer Clinical Senior Lecturer Adi Rachmiel Clinical Senior Lecturer

Michal Rahat Senior Lecturer

Alexander Rozin Clinical Lecturer

Yael Shachor-Meyouhas Clinical Lecturer

Shai Shen-Orr Senior Lecturer

Gary Sinoff Clinical Senior Lecturer

Ido Solt Clinical Senior Lecturer

Mahmoud Suleiman Clinical Senior Lecturer

Tamar Tadmor Clinical Lecturer

Naveh Tov Clinical Lecturer

Simon Vulfsons Clinical Lecturer

Mattitiahu Waterman Clinical Lecturer

**Devy Zisman** Clinical Lecturer

#### Awards & Honors

![](_page_63_Picture_1.jpeg)

SELECTED LIST Distinguished

Prof. Dan Shechtman Faculty of Materials Engineering 2011 Nobel Prize in Chemistry

Dr Gil Alexandrowicz Schulich Faculty of Chemistry Wolf Foundation, 2012 Krill Prize

Distinguished Prof. Yitzhak Apeloig Schulich Faculty of Chemistry Federal Republic of Germany, Order of Meritl

#### Prof. Hagit Attiya

Faculty of Computer Science • ACM-EATCS, 2011 Edsger W. Dijkstra Prize in Distributed Computing • Yad Hanadiv (Rothschild Foundation), 2011 Michael Bruno Award

Prof. Emeritus Zeki Berk

Faculty of Biotechnology and Food Engineering International Association of Engineering and Food (IAEF), Lifetime Achievement Award

Prof. Eli Biham Faculty of Computer Science • 2012 RSA Conference Award • International Association for Cryptologic Research, Distinguished Lecturer for 2013

Distinguished Prof. Aaron Ciechanover Rappaport Faculty of Medicine Alexander von Humboldt Foundation, Humboldt Research Award

**Prof. Gad Eisenstein** *Faculty of Electrical Engineering* Istituto Veneto di Scienze, Lettere ed Arti, Elected as Foreign Member

Prof. Gershon Elber Faculty of Computer Science Dagstuhl Seminar on Geometric Modeling, 2011 John A. Gregory Memorial Award

Prof. Yonina Eldar Faculty of Electrical Engineering Tel Aviv-Jaffa Municipality, 2011 Weizmann Prize in Exact Sciences

Prof. Lior Gepstein Rappaport Faculty of Medicine European Society of Cardiology (ESC), Outstanding Achievement Award

Prof. Michael Glickman Faculty of Biology German Technion Society, 2012 Science Prize

**Prof. Emeritus David Hasson** *Wolfson Faculty of Chemical Engineering* Mifal Hapayis, 2011 Landau Award for Sciences and Research

Distinguished Prof. Avram Hershko Rappaport Faculty of Medicine University of Haifa, Honorary Doctorate

#### **Dr Kinneret Keren**

Faculty of Physics EBSA (European Biophysical Societies' Association), 2011 Young Investigator's Medal Prof. Ilan Marek Schulich Faculty of Chemistry • Royal Society of Chemistry (RSC), 2011 Organometallic Chemistry Award • 2012 Janssen Pharmaceutica Prize for Creativity in Organic Synthesis

Prof. Emeritus Shimon Mizrahi Faculty of Biotechnology and Food Engineering Israel Food Industries Association, 2011 Lifetime Achievement Award in the Academia

Distinguished Prof. Mordechai (Moti) Segev Faculty of Physics Israel Academy of Sciences and Humanities, Elected Member

Prof. Emeritus Edna Shaviv Faculty of Architecture and Town Planning American Solar Energy Society, Passive Solar Pioneer Award

Distinguished Prof. Dan Shechtman Faculty of Materials Engineering Israel Chemical Society, 2011 Gold Medal

Prof. Moshe Tennenholtz Davidson Faculty of Industrial Engineering and Management ACM/SIGART, 2012 Autonomous Agents Research Award

#### Distinguished Prof. Emeritus Daniel Weihs

Faculty of Aerospace Engineering Ben Gurion University of the Negev, Honorary Doctorate

Prof. Emeritus Moussa Youdim Rappaport Faculty of Medicine
X International Catecholamine Symposium, Giant Pioneer of Catecholamine Field
International College of Neuropsychopharmacology, 2012 CINP Pioneers in Psychopharmacology Award

#### EUROPEAN RESEARCH COUNCIL

Starting Grants Prof. Roy Kishony Faculty of Biology

Assoc. Prof. Shulamit Levenberg Faculty of Biomedical Engineering

Assoc. Prof. Pini Gurfil Faculty of Aerospace Engineering

#### COUNCIL FOR HIGHER EDUCATION

Allon Fellows Dr Guy Bartal Faculty of Electrical Engineering

Dr. Amir Yehudayoff Faculty of Mathematics

Dr Amos Yarom Faculty of Physics

#### **TECHNION PRIZES**

Alexander Goldberg Prize Prof. Israel Cohen Faculty of Electrical Engineering

Henri Gutwirth Foundation Research Grants The Henri Gutwirth Foundation supports research grants at the Technion since 1973.

Assoc. Prof. Mark Gandelman Schulich Faculty of Chemistry

Dr Kinneret Keren Faculty of Physics

**Dr Itai Yanai** Faculty of Biology

Juludan Research Prize For outstanding research in the application of modern scientific or engineering techniques to medicine, which holds the potential of developing processes, products, or devices having practical application.

Dr Dvir Yelin Faculty of Biomedical Engineering

**Ray and Miriam Klein Research Prize** For an outstanding research work that contributes to Israel's industry, technology, security or scientific standing.

Assoc. Prof. Yair Ein-Eli Faculty of Materials Engineering

#### Kurt Mahler Prize in Mathematics for 2011 For excellence in mathematics including applied

Prof. Michail Zhitomirskii Faculty of Mathematics

mathematics.

#### Hershel and Hilda Rich Technion Innovation Awards

These awards, established in 1992, are presented to students, faculty members, or employees for outstanding innovative projects with commercial potential.

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**Prof. Yoram Reiter and Dr Rony Dahan** Faculty of Biology

Dr Avner Rothschild Faculty of Materials Engineering

Prof. Moshe Shoham and David Zarrouk Faculty of Mechanical Engineering and Prof. Menashe Zaaroor Rappaport Faculty of Medicine

Prof. Nir Tessler and Ariel Ben-Sasson Faculty of Electrical Engineering

#### Henry Taub Prizes for Academic Excellence

Established in 1986, these prizes recognize faculty members who demonstrate exceptional achievements in research, teaching and service to the Technion.

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**Dr Gil Alexandrowicz** Schulich Faculty of Chemistry

Prof. Michael Glickman Faculty of Biology

Assoc. Prof. Tamar Ziegler Faculty of Mathematics

Assoc. Prof. Dovev Lavie Davidson Faculty of Industrial Engineering and Management

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Published by the Division of Public Affairs and Resource Development

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