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“The Technion is one of the cornerstones of Israel’s development. Its achievements in the last forty years and even more its future tasks are the mainstay of our progress and strength, our security and pride.”

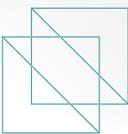
- David Ben-Gurion

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“I have seen with great satisfaction how the Technion has been indispensable to Israel’s agriculture, industrial development, economic growth and national security. Its engineers, scientists and architects have literally built the State of Israel.”

- Albert Einstein





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## From the President

Visitors to Technion's campus invariably admire the stunning panoramic view. Indeed, from Mt. Carmel one can observe a microcosm of modern-day Israel: a sprawling urban landscape that is home to a diverse population, alongside the sea, forests and hills. Looking even farther afield, one can't help noticing that Technion is strategically situated in more ways than one. The trailblazing research and initiatives carried out by Technion students, faculty and alumni are at the very epicenter of Israel's DNA; and as Israel celebrates 70 years of independence, I am proud of the central, pioneering role Technion has consistently played within Israeli society throughout its history.

In fact, Technion's vision has always paralleled Israel's development. As early as 1905, when there were only roughly 60,000 Jews in Palestine, a committee of three – that included Martin Buber, then a Viennese philosophy student and political writer, Chaim Weizmann, who was then a chemistry student and a lecturer at the University of Geneva, and Berthold Feiwel, a journalist and editor from Berlin – envisioned opening an Engineering school to educate the builders of the future Jewish State. At the time, when Jews were excluded from most technological studies in Europe, these early visionaries were planning for a distant and extremely remote future. Unbelievably, the original far-fetched dream of establishing a world-class center of science and technology in the Holy Land was fulfilled even before the founding of the State. Since its cornerstone was laid in 1912, Technion has nurtured an environment of forward-thinking audacity. Although in 1924 the first class consisted of only 17 students, the university grew rapidly in the 1930s following large waves of immigration and has continued to grow ever since.



Technion Cornerstone Ceremony 1912

When Israel achieved independence in 1948, Technion was expected to play a seminal role in building the new country. The post-State vision was that Technion grads would fill key positions in industry, would be responsible for the new country's infrastructure and would be at the forefront of developing its military capabilities. In 1951, Prime Minister David Ben-Gurion articulated the Technion's crucial role in a letter to Colonel Jehiel Elyachar, who was the president of the American Society for Technion: "The value that the Government of Israel places on higher education and scientific and technological research, regarding the State of Israel's security and growth, obligates the Government to do everything it can to cultivate and support the Technion in Haifa as an outstanding technological institute in Israel." Clearly, Ben-Gurion and the other leaders counted on Technion and its graduates to build the country, and the Prime Minister was personally involved in the university's development.

Technion did not disappoint Ben-Gurion. The university continued to expand, always one step ahead of what seemed sensible. When the Department of Aeronautical Engineering (later renamed the Faculty of Aerospace Engineering) was founded in 1954, skeptics scoffed since Israel had a handful of airplanes and no aerospace industry. Yet, Israel Aerospace Industries (IAI) was founded that same year, and Technion's grads were instrumental in developing Israel's Air Force. In fact, since its inception, Technion alumni from every faculty have held high-level positions in all of Israel's vital industries and have played decisive roles in turning Israel into the tech giant that it is today.

At Rafael, Israel's main developer of advanced defense systems, founded in 1948, 75% of its engineers are Technion grads; and it was a group of Technion alumni at Rafael who developed the Iron Dome missile-defense system. Iron Dome was recently named the greatest Israeli invention of all times in a contest held by the Ministry of Economy and Industry in honor of Israel's 70<sup>th</sup> birthday.

In the 21<sup>st</sup> century, Technion has continued to fulfill its vision as a pioneering institution that is attuned to the country's needs. It has been at the forefront of the "start-up nation," actively encouraging entrepreneurship through a range of initiatives. To date, thousands of start-up companies have been established by Technion alumni, some of which are extremely successful on a global scale. It is safe to say that no university in any country has ever enjoyed such a symbiotic relationship with the community at large. In fact, seven out of the 12 "Industry Leaders" selected by the Ministry of Economy in honor of Israel's 70<sup>th</sup> Independence Day are Technion alumni.

On a global level, Technion has definitively affirmed its stature at the vanguard of science and technology. Nothing symbolizes the university's global recognition more than the fact that three faculty members and one alumna have received the ultimate distinction – the **Nobel Prize**. In 2004, two Technion scientists became the first Israelis to bring home the Nobel Prize in science. Profs. Avram Hershko and Aaron Ciechanover – together with colleague Irwin Rose – won the Nobel Prize in Chemistry for the discovery of ubiquitin-mediated protein degradation. In 2011, the Nobel Prize



Technion Nobel Laureates (L to R): Prof. Aaron Ciechanover, Prof. Avram Hershko, Prof. Dan Shechtman



for Chemistry was awarded to Prof. Dan Shechtman, for his discovery of quasiperiodic crystals; and in 2013, Prof. Arieh Warshel, a Technion grad, received the Nobel Prize in Chemistry for the development of multiscale models for complex chemical systems.

However, I am equally proud of our numerous other alumni and faculty members who, over the years, have been responsible for so many remarkable scientific breakthroughs and have been honored with an array of prestigious awards. Their cumulative work has made our world a better place and has had a significant impact on humanity as a whole.

One example is Prof. Marcelle Machluf, Dean of the Faculty of Biotechnology and Food Engineering, who was one of the distinguished honorees invited to light the 12 torches at Israel's official 70th Independence Day ceremony at Mount Herzl in Jerusalem. Her research has led to a new drug delivery system for cancer therapy that targets cells in a non-toxic manner. Another example is Prof. Mordechai (Moti) Segev, the Robert J. Shillman Distinguished Professor of Physics, and his team, who have recently developed a groundbreaking semiconductor laser system that paves the way towards a new class of active topological photonic devices. These are only two among so many Technion professors whose research has been hailed by the international scientific community.

On the cusp of Israel's eighth decade, Technion is poised to further strengthen its standing as a cutting-edge innovator. We are determined to continue being on the front lines of science and technology in order to better serve our country and, indeed, all of humanity. In order to ensure that Technion will remain true to its founders' vision of creating a world-class institute of scientific and technological education, I am pleased to announce the launch of a **World Wide Campaign**, whose goal is to raise \$1.5 billion by 2024 – the year we will be celebrating the centennial of Technion's first class. This campaign will in itself be groundbreaking, as its scope is unprecedented in Israeli academia. The funds raised during this ambitious campaign will be used for upgrading our infrastructure and research activities, as well as for faculty recruitment, and will essentially ensure the next 100 years of Technion.

Recruiting **new faculty** has been an important priority in recent years, as the baby boomer generation reaches retirement age. In the last ten years, we have replaced close to half of our faculty members, and the new hires are extremely talented and qualified. The new, young faculty members have not only helped rejuvenate and reenergize the university, they have boosted Technion's reputation as a cutting-edge institution at the forefront of global technology and science. This is a process that will continue to be a priority during the next decade as well.



Prof. Marcelle Machluf lights torch

In the past year, we also made great progress implementing the Master Plan to upgrade the physical campus. If you walk around, you won't be able to miss the **building boom**. We have added new wings to the David and Janet Polak Visitors' Center; we are renovating the Ullmann building, which is the main teaching facility; and we are installing new gates to the campus. Soon we will add new wings to the faculties of Electrical Engineering, Materials Science and Engineering, and Architecture and Town Planning. In addition, we are planning new buildings for the Rappaport Faculty of Medicine as well as new student dormitories.

Other important developments include the recent establishment of two new interdisciplinary centers. The first, the Technion Integrated Cancer Center, facilitates interaction of researchers in all areas of science with engineers and clinicians, including oncologists, with the aim of translating basic discoveries into medical applications. The second, the Helen Diller Center for Quantum Science, Matter and Engineering, will be an interdisciplinary home for researchers and will strengthen the university's position as a world leader in quantum science and engineering. The new Quantum Center was made possible thanks to a \$50 million gift by the Helen Diller Family Foundation.

In addition to focusing on enhancing our facilities and our faculty here in Israel, this past year will be remembered as a turning-point for Technion on the world stage. After years of planning and hard work, I recently had the honor of inaugurating both the Jacobs Technion-Cornell Institute in New York City and the Guangdong-Technion Israel Institute of Technology in China. These institutions firmly ensconce Technion in the global academic village, fostering the flow of knowledge across international borders and further boosting Israel's position as a global leader in technology and science.

The **Jacobs Technion-Cornell Institute (JTCI)**, situated on Roosevelt Island in New York City, is a unique partnership between two highly respected universities. Technion provides the aura of the "startup nation" as well as its outstanding reputation in the fields of entrepreneurship and applied research. At the inauguration ceremony on September 13, 2017, I said that, "One of the current most pressing issues facing universities and academic institutes world-wide is the search for the best means to adapt to the fourth industrial revolution – the digital revolution – the Machine Age. Driven by the Internet of Things, Artificial Intelligence and the notion of robotics replacing human labor, our machines are exhibiting abilities they have never had before. Companies are making more money and hiring fewer people. But the positions that are irreplaceable by machines, no matter how intelligent, are those that require social intelligence, creativity and perception – characteristics



Inauguration Guangdong Technion Israel Institute of Technology



we aim to cultivate at the Jacobs Technion-Cornell Institute, alongside excellence in sciences and engineering.”

The new **Guangdong Technion Israel Institute of Technology (GTIIT)**, a joint venture of Technion and Shantou University located in Guangdong Province, China, was inaugurated at a festive ceremony on December 18, 2017. I am happy to report that the campus is already thriving and in its first year there are 15 Technion-quality faculty members and 220 students. GTIIT, which is supported by the governments of Guangdong and Shantou and the Li Ka Shing Foundation, is on the way to fulfilling the vision of becoming an international technological university engaged in cutting-edge research. It will boost entrepreneurship and technology transfer and nurture a high-tech industrial ecosystem in the city of Shantou and throughout Guangdong Province. My speech at the inauguration ceremony highlighted the sense that the new campus is not only a milestone for Technion but, also, for the country we proudly represent: “We welcome in a new era of cooperative research between Israel and China in science, engineering and the life sciences,” I said.

I have no doubt that the opening of these two new academic ventures in America and in Asia will have a significant impact on Technion’s ability to meet its strategic goal of becoming a global world-class university. Lately, the number of requests we receive to sign strategic agreements with foreign universities has been overwhelming. I’m certain that the new partnerships in New York and Guangdong explain this surge in interest.

In line with our century-old tradition of enriching and contributing to our community, Technion’s short-term plans for the upcoming year will focus on Israel’s **ultra-Orthodox** population. Just as Technion successfully integrated Israeli Arabs on campus, a new project aims at including larger numbers of ultra-Orthodox Jews in the student body. In my view, this is no less than a national mission; their integration into the workforce is greatly beneficial both for the ultra-Orthodox community themselves and for Israel as a whole. The first year of the new program will feature pre-academic training at the Open University, in partnership with the Open University and the Jerusalem College of Technology–Lev Academic Center. Those who will successfully complete the first year will continue as regular students at Technion’s Faculty of Computer Science. Our goal is to have 300 ultra-Orthodox students, both men and women, studying at Technion within the next five years.

Unfortunately, alongside the many uplifting accomplishments of the past year, we have also been struck with a succession of sad news. Technion – and I personally – mourn the loss of three of our dearest friends: Ruth Rappaport, Peter Munk and Sanford Diller.

**Ruth Rappaport** devoted her life to people, to the State of Israel, to the city of Haifa and to Technion in particular. Ruth and her husband Baruch were the generous benefactors behind the establishment of the Rappaport Faculty of Medicine and the Rappaport Family Institute for Research in the Medical Sciences, which they continued to support over the years. Technion awarded Ruth Rappaport an honorary doctorate in 2014, in gratitude for her philanthropic work and her generous humanitarian spirit. She passed away in February at age 94.

**Peter Munk**, the Canadian businessman, investor, and philanthropist, died in March at age 90. Throughout his life, he was a generous supporter of the Jewish People and the State of Israel, as well as of Canadian universities and medical institutes. Peter Munk was one of Technion’s great benefactors and received a Technion Medal in 2013.

**Sanford Diller**, who passed away in March at age 89, and his wife Helen, who died in 2015, were true friends of Israel and generous philanthropists who believed deeply in democratic and Jewish values and in educating the next generation. Their daughter, Jackie Safier, recently announced a very generous gift to Technion by the Helen Diller Family Foundation for a new state-of-the-art Center for Quantum Science, Matter and Engineering.

May their memories be a blessing.



The current gathering of the Board of Governors is an ideal time to reflect on the accomplishments and events of the past year and to prepare for the year ahead. Looking both towards the past and the future, I can confidently assert that Technion continues to stay true to the course that was set in motion in 1905 by Buber, Weizmann and Feiwel, and later by Ben-Gurion – a course that embraces the challenges ahead and proudly assumes the great responsibilities of serving one’s country and all of humanity. From my window on Mt. Carmel, I clearly see Technion’s special position atop one of Israel’s most celebrated peaks.

In the words of the Polish-Jewish educator Janusz Korczak, “The one who cares for the future, plants wheat. The one who cares for the years to come, plants trees. The one who cares for future generations, educates people.”



Opening Cornell Tech



## Governance 2018

### Leadership

**Lawrence Jackier**

Chairman of the Board of Governors

**Gideon Frank**

Chairman of the Council

**Prof. Peretz Lavie**

President

**Prof. Adam Shwartz**

Senior Executive Vice President

**Prof. Hagit Attiya**

Executive Vice President for Academic Affairs

**Prof. Wayne Kaplan**

Executive Vice President for Research

**Matanyahu Englman**

Executive Vice President and Director General

**Prof. Boaz Golany**

Vice President for External Relations and Resource Development

### Deans

**Prof. Orit Hazzan**

Dean of Undergraduate Studies

**Prof. Dan Givoli**

Dean of the Jacobs Graduate School

**Prof. Benveniste Natan**

Dean of Students

**Prof. Zeev Gross**

Dean of Azrieli Division of Continuing Education and External Studies

### Deputy Executive Vice Presidents

Deputy Senior Vice President

**Prof. Alon Hoffman**

Deputy Vice President for Research

**Prof. Anath Fischer**

Deputy Vice President for Research for Pre-Clinical Research Authority

**Prof. Jackie Schiller**

Deputy Vice President for Academic Affairs

**Prof. Avi Ostfeld**

Deputy Vice President for Computing and Information Systems

**Prof. Reuven Cohen**

Deputy Vice President for Safety Matters

**Prof. Yaacov Mamane**

Deputy Director General for Finance

**Dganit Shindelman**

Deputy Director General for Human Resources

**Ariel Hazan**

Deputy Director General of Operations

**Zehava Laniado**

## **Academic Heads**

Faculty of Aerospace Engineering  
**Prof. Itzhak Frankel**

Faculty of Architecture and Town Planning  
**Prof. Iris Aravot**

Faculty of Biology  
**Prof. Yehuda Assaraf**

Faculty of Biomedical Engineering  
**Prof. Shulamit Levenberg**

Faculty of Biotechnology and Food Engineering  
**Prof. Marcelle Machluf**

Wolfson Faculty of Chemical Engineering  
**Prof. Gideon Grader**

Schulich Faculty of Chemistry  
**Prof. Noam Adir**

Faculty of Civil and Environmental Engineering  
**Prof. Oded Rabinovitch**

Faculty of Computer Science  
**Prof. Dan Geiger**

Faculty of Education in Science and Technology  
**Prof. Yehudit Judy Dori**

Viterbi Faculty of Electrical Engineering  
**Prof. Nahum Shimkin**

Department of Humanities and Arts  
**Prof. Efraim Lev**

Davidson Faculty of Industrial Engineering and  
Management  
**Prof. Carmel Domshlak**

Faculty of Materials Science and Engineering  
**Prof. Yair Ein-Eli**

Faculty of Mathematics  
**Prof. Michah Sageev**

Faculty of Mechanical Engineering  
**Prof. Yoram Halevi**

Rappaport Faculty of Medicine  
**Prof. Shimon Marom**

Faculty of Physics  
**Prof. Ehud Behar**

## **Guangdong Technion-Israel Institute of Technology**

Vice Chancellor, Distinguished  
**Prof. Aaron Ciechanover**

## **Joan and Irwin Jacobs Technion-Cornell Institute**

**Prof. Ron Brachman**

## **Assistant to the President for Strategic Projects and Head of Technion International**

**Prof. Paul Feigin**

## **Technion Program for Excellence**

**Prof. Michael Elad**

## **Center for Pre-University Education**

**Prof. Noam Soker**

## Academic Affairs

### Faculty Recruitment

Recruiting and retaining excellent faculty members remain important objectives for the Technion. During recent Board of Governors meetings, the Executive Vice President for Academic Affairs reported on the efforts to facilitate the recruitment process and to make it possible for the Technion to enlist the best faculty. We have set an ambitious goal of increasing the number of faculty to around 600 by 2020 without compromising on the quality of the new recruits.

The Technion has established several interdisciplinary programs, as well as special programs in nanotechnology, life sciences, autonomous systems and energy programs, which allow the increase in the number of faculty members recruited. This increase is also supported by a long-term policy implemented by the government of Israel, to provide significant additional resources to the Technion, for example, through the *I-Core* framework, supported by VATAT.

During the 2017/18 academic year, we recruited 28 new faculty (to date). We hope to continue recruiting about 25-30 new faculty each year until 2020. Figure 1 summarizes recruitments, retirements and departures over the ten years leading to 2020.

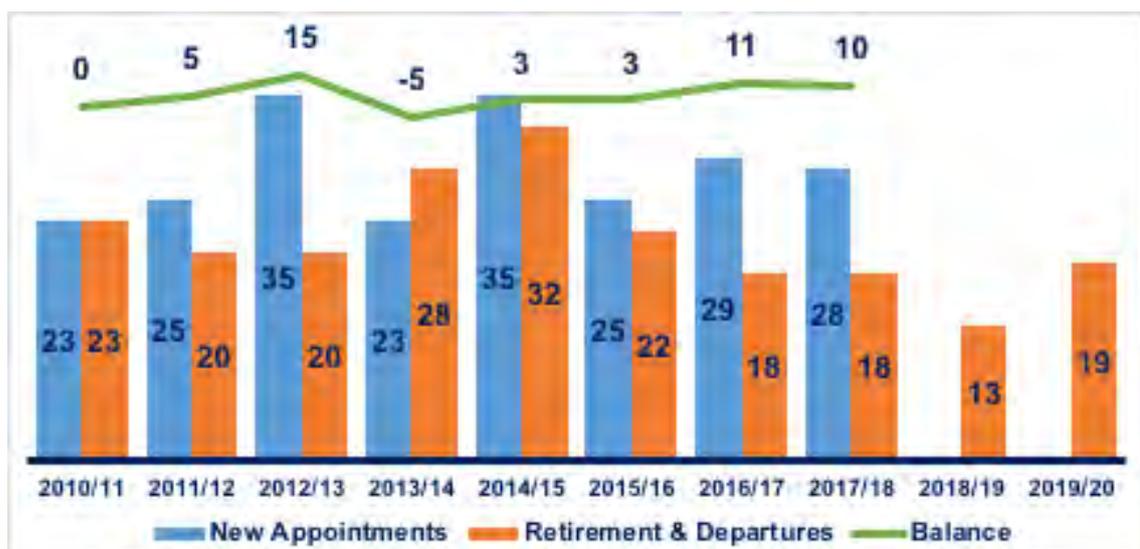


Figure 1. New appointment vs. retirements and departures (\* up to date).

To continue recruitment at this rate, faculties use advertising and proactive recruitment. The Technion participated in several successful career fairs and identified several excellent candidates. The Technion has made several post-doctoral fellowships available to excellent candidates, at top institutions such as MIT and University of Toronto, several of these post-docs were already recruited as faculty members.

The massive turnover of faculty members provides an opportunity for the Technion to strengthen its academic standing by recruiting the most brilliant and innovative minds. Excellent academic institutes, domestic and international, are courting these people, and the Technion is facing a tough competition. To attract talented faculty members, the Technion offers substantial start-up packages for equipping a laboratory shortly after the new faculty member arrives. New recruits have a reduced teaching and administrative load for the first two years. To ease the transition to a faculty position, the Technion offers generous help with relocation costs for new faculty members and their families, as well as on-campus housing at the **Stanley Shalom Zielony Graduate Student Village** for the first few years. In many cases, the Technion helps to identify employment opportunities for spouses.

Fund-raising programs like the newly-established **Zuckerman Scholar Award**, the renowned **Leaders in Science and Technology** program and various **Career Advancement Chairs**, help to attract and integrate excellent faculty members. These programs offer support, infrastructure and equipment for 8-10 outstanding young faculty members each year, and play an important role in ensuring that this excellent crop of brilliant faculty members choose the Technion over attractive offers from other universities or industry, abroad and in Israel.

The brilliance of our young faculty members is evident from the fact that each year, several of them win various prizes and distinctions. This year, **four** of our new faculty members won the prestigious **Alon Fellowship**:



**Assistant Prof. Elad Koren** from the Department of Materials Science and Engineering received his PhD at Tel-Aviv University. He arrived to Technion after a post-doc at IBM labs in Zurich, Switzerland. His main research interests are Nanoscale characterization of electronic and opto-electronic materials and novel devices; mechanical and electro-mechanical manipulation and characterization of low dimensional elements in the super lubricity regime; low dimensional materials such as nanowires (Si, Carbon Nanotubes, III-V), 2-dimensional materials (Graphene, MoS<sub>2</sub>, h-BN), their heterostructures and interfaces.



**Assistant Prof. Nadav Amdursky** from the Schulich Faculty of Chemistry received his PhD at Tel-Aviv University and continued to a first post-doc at the Weizmann Institute of Science, where he worked on electron transport across proteins. At his second post-doc at Imperial College, London, he worked on charge conduction across biological scaffolds. His research focuses on understanding the various charge transfer properties in biology.

## The Leaders in Science and Technology Program and Career Advancement Chairs

*Leaders in Science and Technology Program, initiated and supported by Mr. Henry Taub*

*Shillman Career Advancement Chair*

*Chaya Career Advancement Chair*

*Andro Deloro Career Advancement Chair*

*Leona Chanin Career Advancement Chair*

*Shalon Career Advancement Chair*

*David and Inez Myers Career Development Chair in Life Science*

*Career Advancement Chair in Economy and Finance*

*Ravitz Foundation Career Advancement Chair*

*Jacques Lewiner Career Advancement Chair*

*Women Division Career Advancement Chair*

*Jack Klein Career Advancement Chair in Cancer Research*



**Assistant Prof. Kinneret Teodorescu** from the William Davidson Faculty of Industrial Engineering studies search behavior and related aspects of decision making from both psychological and economic point of views. She received her PhD in Behavioral Sciences from the Technion and spent two years as a post-doctoral fellow at Indiana University. Dr. Teodorescu's main research deals with the interplay between optimal search and human behavior: Why people deviate from optimal exploration? When people do not search enough and when do they search too much? Additional questions relate to how people select their search strategies and how different contexts/environments factor into generating a set of available strategies to choose from.



**Assistant Prof. Naama Geva-Zatorsky** from the Ruth and Bruce Rappaport Faculty of Medicine received her PhD at the Weizmann Institute of Science and continued to a post-doc at the Harvard Medical School. She published in *Cell*, *Science* and *Nature*, and has received several awards, such as the national and international UNESCO-L'Oreal award, the Human Frontiers fellowship, the EMBO fellowship, the John F. Kennedy Prize, the Teva Prize and the Barenholz prize. Her research applies systems biology thinking strategies together with Microbiology and Immunology to study the gut microbiota (including bacteria and bacteriophages), and their effects on the physiology of the mammalian host.

**Two** additional young faculty got the prestigious **Azrieli Fellowship**, awarded to outstanding young scientists, who seek faculty positions at Israeli universities:



**Assistant Prof. Ido Kaminer** from the Andrew and Erna Viterbi Faculty of Electrical Engineering completed his PhD at the Technion and was a postdoctoral fellow at MIT. His research focuses on using graphene plasmons to engineer compact sources of x-ray; enabling forbidden selection rules in atomic transitions; a complete analytic quantum theory describing the emergence of shock waves of light, i.e., Cherenkov radiation; enabling efficient conversion of electrical energy to light in graphene; novel dynamics of light in photonic crystals; fun hard-code theory on mind-boggling physics: quantum particles that accelerate with no external force and even exhibit time dilation and length contraction; discovering beams of light that bend themselves in free space along steep curves: new analytic solutions of Maxwell equations; and solitons: stochastic recurrent dynamics in complex networks.



**Assistant Prof. Graham de Ruiter** from the Schulich Faculty of Chemistry received his PhD at the Weizmann Institute working on sequence-dependent assembly strategies and molecular logic. For his post-doc, he moved to the California Institute of Technology to work on the synthesis of multi-metallic complexes for small molecule activation and oxygen atom transfer reactions. His research focuses on developing new stimuli responsive materials for applications in molecular heterogeneous catalysis, and chiral sensing.

For the second consecutive year, **three** of our young faculty members won the prestigious national **Krill Prize** from the Wolf Foundation, awarded to ten pre-tenure faculty members each year, for excellence in scientific research:



**Assistant Prof. Meytal Landau** from the Faculty of Biology obtained her PhD at Tel-Aviv University followed by a post-doc at UCLA. Her research focuses on the mechanistic details of regulation in proteins that are central to physiological and pathophysiological processes. Her research aims to unveil the relationship between ligand-binding, dynamics, activation and transduction of signals, and to manipulate these processes using allosteric small-molecule modulators. She uses a multidisciplinary approach, which involves structural characterization via x-ray crystallography and electron microscopy, bioinformatics and small-molecule

design.





**Assistant Prof. Charles E. Diesendruck** from the Schulich Faculty of Chemistry received his PhD in Organometallic Chemistry from Ben-Gurion University, followed by a post-doc in mechanochemistry and self-healing materials at the Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign. He received the Ruth and Milton Orchin Prize from the Israel Chemical Society, the Hyman and Irene Kreitman Prize from Ben-Gurion University, and a Minerva short-term grant for research in Germany. His main research interests are: chemistry of materials; use of molecular architecture for

directing mechanical forces in polymeric molecules and aggregates; development of mechanical force resistant and self-healing materials; use of mechanical force to drive phase distribution in copolymers and polymer blends; and the development of new chemical reactions using organometallic complexes.



**Assistant Prof. Yakov Babichenko** from the William Davidson Faculty of Industrial Engineering received a PhD in Mathematics from the Hebrew University. He joined Caltech as a post-doc at the Center for the Mathematics of Information, where he received the Walter S. Baer and Jeri Weiss fellowship. His main area is *game theory*, specifically, adaptive learning in games and the rate of convergence of these adaptive processes. Another, related, area of interest is the complexity of equilibria in games in several complexity models such as computational complexity, communication complexity, and query complexity.

Last, but certainly not least, are the **two** winners of the inaugural **Blavatnik Faculty Awards** (out of a *total of three nation-wide*). The first is **Assistant Prof. Charles E. Diesendruck**, mentioned above for winning the Krill prize, while the second is:



**Assoc. Prof. Anat Levin** from the Andrew and Erna Viterbi Faculty of Electrical Engineering obtained her PhD at the Hebrew University in Jerusalem followed by a post-doc at MIT. She joined the Technion after a few years as a member of the Department of Mathematics and Computer Science at the Weizmann Institute of Science. Assoc. Prof. Levin is the recipient of, among others, the Bruno Memorial Award, the Levinson Prize, the PAMI Young Researcher Award and the Krill Prize. Her research interests are in the areas of computer vision, computer graphics and

image processing and optics, in particular, computational photography as well as low- and mid-level vision.

**Post-doctoral fellows:** We increased the number and quality of foreign scientists who come to the Technion for post-doctoral training: the number of foreign post-docs has quadrupled since 2008/9, and there is a marked increase in their academic excellence.

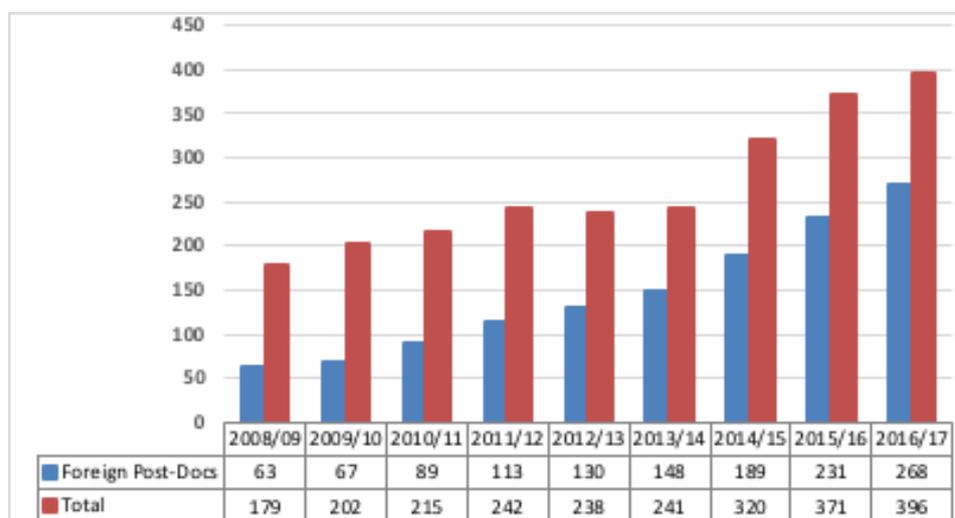


Figure 2. Number of post-doctoral researchers 2008-2017



New Faculty Orientation Day

## International Review Committees

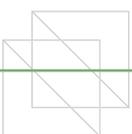
Each year, selected departments (or programs) undergo an extensive internal (Technion) evaluation by an ad-hoc International review Committee. In parallel, the Council for Higher Education (MALAG-CHE) has its own one-day evaluation of selected programs. This year (2017), The Faculty of Education in Science and Technology underwent internal review.

The Committee, headed by Prof. Joseph Krajcik (Michigan State University) convened in May 2017. The report states that "The Faculty of Education in Science and Technology holds a unique position within Israel and throughout the world. One of major strengths of the faculty is the impressive focus on disciplinary knowledge in science, technology, engineering and mathematics (STEM) education. The mission of the Faculty of Education in Science and Technology is to pursue excellence and leadership in STEM education in Israel and throughout the world through innovative and state-of-the-art teaching and research. This mission is consistent with Technion's leading role as major international research university in engineering and technology. STEM education is becoming more prominent in educational research worldwide".

The report details a series of recommendations, including:

- Additional focused Faculty recruitment
- Recommendations on additional courses and their framework
- Facilitating international cooperation
- Assistance in funding postdoctoral training for outstanding students with a potential to return to Israel.

This year (2018), the Faculty of Architecture and Town Planning, as well as the Faculty of Computer Science are scheduled to undergo internal evaluation, while the Faculty of Mechanical Engineering will undergo CHE's evaluation.



## Department of Humanities and Arts and Enrichment Studies

Over the past years we have seen a steep growth in the supply and demand for our courses among Technion undergraduate students. The “enrichment courses” are proving a great success. The students are required to choose at least 3 courses (6 credit points) from a rich and varied list of these courses during their undergraduate degrees. The program is now in its sixth year, and both students and teachers have provided very positive feedback concerning this humanities enrichment program. The students are enjoying the courses that widen their horizons and challenge their way thinking. The cooperation between the Technion and Haifa University is proving a success for students and lecturers alike. The Council of Higher Education, in its last call for proposals on promoting enrichment programs, has endorsed this mode of cooperation by suggesting it as an option for other universities and colleges to adopt. The Technion and Haifa University are working to develop a further set of courses for the enrichment program beyond the 65 approved so far. This year alone, 25 courses are being taught by scholars from the University of Haifa.

During the past year, 2016-2017, about 5,000 undergraduate students studied in these enrichment courses each semester. Each semester over 50 courses are taught by Technion adjunct lecturers. In addition, the Department of Humanities and Arts offers students courses in drawing and art, photography, jazz, orchestra, choir and sports, as well as the wide variety of enrichment courses. These are very popular and Technion students, faculty and staff benefit from the opportunity to attend and enjoy orchestra, choir and jazz concerts at the end of every semester. Furthermore, we intend on preparing art and photography exhibitions in and around the campus.

We in the Department, headed by Prof. Efraim Lev, seconded from Haifa University, are always looking for ways to expand and diversify to provide the students with more opportunities to learn and develop. By means of introducing new courses and bringing new young talented lecturers to teach these courses in the Technion, we are gradually expanding the subjects taught in our department and have recently added requested subjects of interest such as the Philosophy of Science and Technology. In addition, we are in the initial stages of establishing a program for future engineers, to expose students to a wide variety of entrepreneurs and their life experiences.

The department is proud to announce the continued cooperation with the Italian Embassy in Israel and the Italian Institute of Culture in Haifa. Thanks to this cooperation, high-level professional teaching of the Italian language is offered to Technion students every semester both at the beginners and intermediate levels.

Another successful project of cooperation was initiated at the beginning of last year, was with the Haifa Philharmonic Orchestra. The conductor Dr. Roy Oppenheim teaches an academic music course



Alan Alda at Technion



to undergraduate students and as part of the course requirements, students are invited to attend concerts by the Haifa Philharmonic Orchestra.

Following a substantial donation pledged to the music section of this department by Mrs. Sonia Marshak, purchases are being made for the Technion Orchestra and Jazz band and students are enjoying and feeling the benefits.

A personal department accomplishment this year has been the opening of our much-awaited department internet site. A further accomplishment, with the cooperation of the Department of External Studies in the Technion, is the opening of the first Technion Language Centre. Initially, support will be given in English to Technion graduate students.

With the opening of the GTIIT University in China, the department is playing an active part in the process of hiring English teachers and approving enrichment courses to be taught in China.

In addition, we are in the initial stages of refurbishing and creating an acoustics room, suitable for students to come and play their musical instruments and rehearse in private, without disturbing others in the department.

## Center for the Promotion of Learning and Teaching (CPT)

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The Center for Promotion of Learning and Teaching (CPT) mission is to support and advance the Technion commitment to excellence in teaching and learning, to promote a cultural shift towards student-centered learning and to encourage and support pedagogical and technological innovation designed to improve instruction and advance learning.

**Learning and Teaching activities:** The CPT conducted a workshop for new faculty staff and four workshops for new TA's (~250/year). Additionally our teaching consultants carried out in-class observations of 20 teaching staff members and of a majority of the new TA's. These observations were followed up with individual consultation to discuss and sum up the practical experience. Our TA training program enables the TA's to grow and develop as educators leading to their designation as the best in the country. Eight workshops were conducted for experienced TA's and adjunct teachers. Additionally, the CPT provided support for curricular and course design and worked with individual faculty to identify appropriate educational technologies and effectively incorporating them into their courses. An Online Handbook for Graduate Teaching Assistants, was developed by the CPT team to provide further orientation for new TA's.

**The Center for Evaluation and Examinations:** The CPT provides faculty members with customized workshops and sessions focused on evaluation. We provided a total of six workshops: one for adjunct teachers, one for TA's and four faculty-wide workshops: Chemistry, Civil and Environmental Engineering, Electrical Engineering and Materials Science & Engineering. In addition, we provided personal guidance and consultation through 50 individual consultation sessions including consultations with new faculty.

We provided services for the scanning, grading and statistical analysis of 300 multiple-choice exams. Additionally we offered interpretation and recommendations in light of the exam results and the statistical analysis. We take pride in the improvement in exam preparation and management at the Technion as reflected in the most recent ASAT report.

A Teaching Evaluation Committee was established to develop a new course evaluation form as well as to examine the mechanism and regulations of the existing survey. The Committee was charged with developing a proposal for a new form more closely tied to student learning designed, which will improve the data we provide the faculty. The final report, which included recommendations and proposals for new questionnaires, was prepared by the CPT team and approved by the Senate.

**Educational Technology Support:** The CPT provides assistance supporting the design and the management of the Moodle system (5300 websites). New Moodle features were implemented to improve the teaching and the learning experience. Perusall, a novel social annotation platform, was integrated into Moodle and presented to the teaching staff. Five workshops and approximately 40



individual training sessions were provided for members of the Technion teaching staff. In addition, special workshops were provided for the Faculty of Medicine and the Faculty of Biomedical Engineering. We take part in the task force charged with implementing online Sexual Harassment Prevention software on campus. We are actively involved in the adoption of the new accessibility regulations at the Technion. We continue to support and promote active learning and peer instruction with web applications such as Socrative and Poll Everywhere. We have provided assistance for the nomination process of outstanding TA's and for the submission process of new curricula and new courses for approval for the office of Undergraduate Studies. The CPT is also responsible for the production of video lessons for regular courses (~20/year) and for courses designed for Coursera and edX.

Educational Innovations: The Center continues to provide pedagogical and technological support for the development and integration of online and hybrid courses of Technion undergraduate courses as well as for the development of MOOCs (~3 courses per year) for Coursera and edX. Pursuant to the submission of 6 proposals to the CHE (1st 2nd and 3rd calls for proposals), the Technion received five funding grants for online course development. The first Course, "Sparse Representations: From Theory to Image Processing" was launched in October, 2017. We also held a special seminar focused on Innovative Pedagogical Approaches with Prof. Eric Mazur.

## Equal Opportunities for Minorities

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### Equal Opportunities for Arab Students

The project for "equal opportunities" in the Technion has been a top priority. During the last year, the project has extended to include not only promotion of students, but, also, promotion of researchers, workers, and faculty members in the Technion. Tens of tailor-made workshop and trainings has been arranged to support each of these groups. The Assistant for the Deputy Vice President for "Equal Opportunities" continues developing and advancing intervention programs among minority students at the Technion. The major aims of the activities planned for 2017 were to further decrease drop-out rates among minority students, to enhance academic excellence, to increase the number of graduate students and faculty members, and to promote the integration of the minority students with the rest of campus.

Minority Students in the Unit for Pre Academic Studies

The project for "equal opportunities" has been a top priority of the Technion and the Mechina.

In October 2016 the number of minority students that started the Mechina was 83, while in October 2017 the number was 104.

Minority Students have a special program, they have extra lessons in Hebrew and English. During the Mechina students are entitled to financial support (the program is supported by the Israeli government).

In addition to the above, PUC provides a course for non-Hebrew speakers- "Step before the others". This course, during summer, is a refresher course in mathematics and Hebrew before academic studies. Last summer there were almost 200 students.

### Programs for Ultra-Orthodox (Haredi) Students

Here is a brief review of the process of acceptance to the Technion:

- Preparatory courses. The program for male students begins with a five-month pre-preparatory course in mathematics and English. This course is designed to bring the students up to the level of a non-college bound high school graduate. Those male students who successfully complete the pre-preparatory course are then eligible for the standard ten-month Technion preparatory course, in which they study mathematics, physics and English. As female students receive a rudimentary high school education, they begin their studies at the Technion with the ten-month preparatory course.
- Matriculation as a degree student at the Technion. Students who complete the preparatory course with sufficiently high grades are admitted to Technion as regular students. The





particular faculties to which they are eligible to matriculate depend on their preferences and on their grades in the preparatory course.

## Updated Statistics

### Men

The first pre-preparatory course for students began five years ago, in the spring of 2013. Less than half of those who started the pre-preparatory course completed it successfully and continued on to the preparatory course. Well over half of those who began the preparatory course complete it with sufficiently high grades to be offered admission as a regular student at the Technion.

The first class of male students enrolled as regular undergraduate students in the fall semester of 2014. These students are now nearing the end of their fourth year at the Technion. All twelve of these students who began their studies in 2014 are still enrolled. Their grade point averages vary, with most of them having reasonable grades. On the other hand, the majority of them are accruing their credits at a slower pace than would be expected from a regular Technion student.

In the fall of 2015, another eight male students enrolled as regular undergraduate students after successfully completing the pre-preparatory and preparatory courses. Besides these eight students, an additional two students who did the preparatory course in Bnei Brak enrolled. Nine of these ten students are still enrolled. The general success of these students is similar to those who started the year before.

In the fall of 2016, another fifteen students enrolled after successfully completing the pre-preparatory and preparatory courses. Three of them have already dropped out.

In the fall of 2017, another eight students enrolled after successfully completing the pre-preparatory and preparatory courses. They are all still enrolled.

### Women

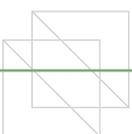
In the fall of 2015, the first group of female students in the haredi program enrolled as degree students after successfully completing the preparatory course. There were five students. Two of them dropped out by the end of the first semester, a third one by the end of the second semester. All three of these students were unmarried. The other two students are married with children. One was completely unsuccessful during the first semester, took a leave of absence during the second semester, and then returned in the fall of 2016. She has been receiving passing grades in her courses now, but she is taking a very low course load (three courses a semester) and is thus accruing credit points quite slowly. This woman is the mother of two young children. The fifth woman is still enrolled in the medical school. She is the mother of three children, one of whom was born during the final exam period of her first semester at the Technion.

In the fall of 2016, another five female students enrolled as degree students. One of them was divorced without children and the other four were unmarried. Three of these have dropped out. The other two are in the three year medical science ``pre-med'' program. They are doing reasonably well, but there is intense competition for a limited number of positions in the medical school program, in which they hope to continue when they finish their three years of study.

Because of the lack of success of the women's program, it has been discontinued, at least for the present.

## Technion – Open University Joint Program for Haredi Students

In recent years the Technion has gained successful experience with haredi students who have joined the Technion in regular programs, after completing a special Mechina at the Haifa campus, or a Mechina + 3 years of study in the Technion Geo-information program in Bnei Brak. The experience is that after such bridging study periods, the students are in a personal and academic position to be



able to successfully join the regular study programs in the Technion Haifa campus.

In view of that success and the favorable experience of accepting regular students to the Technion after one year study at the Open University in coordinated programs (AFIK MAAVAR), a new program has been developed for haredi students. It consists of a 2.5 years bridging period taking place in close proximity to haredi neighborhoods in an Open University site (Tel Aviv, close to Bnei Brak) in special classes, after which they can transfer to the Technion Haifa campus to complete their studies in regular classes. The bridging period consists of 1.5 years of Technion Mechina, followed by 1 year of academic study in a Computer Science program of the Open University, which is coordinated with the Technion program through the AFIK MAAVAR mechanism. Those who prefer to stay near their community will be able to chose to continue their studies at the Open University to obtain a Computer Science degree at that University.

This program was approved by the Council of Higher Education and the first round of students will start in October 2018.

### Ultra Religious (Haredi) Students in the Unit for Pre Academic Studies

The Technion has one ultraorthodox-class (22 students), at the main campus (the class in Bnei-Brak Haredim College in Bnei Brak was not opened). The program consists of six months pre-preparatory program (Kdam Mechina) followed by ten months of preparatory course (Mechina).

The education during the six months of the Kdam Mechina focuses on providing basic skills in mathematics, scientific writing and reading. Students also study how to deal with exams as well as a high load study. At the end of Kdam Mechina we are able to evaluate the students and accept to the Mechina those that have the potential to deal with high-school level of the four basic courses (e.g. mathematics, physics, English and scientific writing). Our experience shows that most ultra-orthodox students are highly motivated but are missing some learning skills. They work very hard, and those that continue to the regular Mechina eventually acquire the necessary skills. About 50% of those that start the pre-preparatory program (Kdam Mechina) are accepted to the Mechina.

Students that successfully complete Kdam Mechina are allowed to continue to the Mechina program. This program from now on is identical to that for the students who finished the secular high school system in Israel. For example, we give all students the same exams. About 75% of ultra-orthodox Mechina students successfully complete the program and are eligible to study at Technion.

The ultra-orthodox program is supported by both the Israeli government and the Technion. They provide tuition fee, dormitories if necessary and minimal expenses to ease the pressure on students with families. In this year (2016-2017) ultra-orthodox students that study at the Technion campus joint the "Hessegim to Hightech" program managed by the Israeli Council for higher Education (via Vatat). We list data on the past two year's graduates in the following table.

Course name	Begin	Ends	Beginners	Graduates
Ultra-orthodox at Technion campus	03/2016	08/2017	14+9	10
Ultra-orthodox at Bnei Brrak	02/2016	08/2017	21+1	17
Ultra-orthodox at Technion campus	03/2017	07/2018	31+12	22*
Kdam Mechina, Ultra-orthodox at Technion campus	03/2018	07/2019	35*	

\*As of today

## Israeli Hope

The President of Israel, Reuven Rivlin, has recognized that there is a growing need for movement beyond the current approach of majorities and minorities in Israel to a new approach of partnership between the different population sectors that make up Israeli society. Accordingly there are four different educational systems for: Secular Jews, National Religious Jews, ultra – orthodox (Haredim), and Arabs. The "Israeli Hope" is the umbrella that embraces the full range of activities undertaken by the President's Office to facilitate partnership between the four population sectors.

Israeli Hope in Academia encourages a more diverse and culturally competent higher education





system, which works to prepare graduates for life in a society valuing partnership.

The four central components in the Israeli Hope in Academia Strategy are:

- Diversity and Representation
- Cultural competence
- The Academia graduate
- Academia – Employment connection

### Israeli Hope at Technion

The Technion joined the program in May 2017. A steering committee was set up, Head of the committee is Prof. Benny Natan, Dean of Students and the coordinator is Efrat Barkai Goral. The committee members are: Prof. Hossam Haick, Prof. Efraim Lev, Prof. Irad Yavne, Ms. Zehava Laniado, Dr. Efrat Eizenberg, Yael Anderman, Dalia Peled, Adi Habibi, Yehuda Morgernstern and Omer Amit.

The Israeli Hope coordinator is working in collaboration with all the persons at the Technion dealing with different cultures and diversity, to make the activities more oriented to Israeli Hope such as the project of equal opportunities, the unit for student advancement, the Social Hub and the Technion Students Association.

### Seminars and conferences:

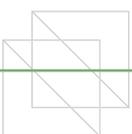
Prof. Natan and Ms. Barkai Goral have participated in several seminars and conferences held by the President's Office.

Achievements and goals:

The achievements and future goals are:

#### 1. Diversity and representation

- Undergraduate Arab students in the Technion are represented at the same ratio as in the Israeli society (around 20%).
- The goal is to increase the number of Arab students in Graduate Studies and to increase the number of Haredi students.
- Actions taken are for example - meetings with Arab students in their 3rd or 4th year to present the benefits of higher education on the one hand and to understand the reasons for not applying, on the other.
- A round table discussion for Haredi students has taken place as a first meeting to try to increase the number of ultra-orthodox students in the Technion.
- HR in the Technion is about to conduct seminars for managers, to specialize in recruiting employees from different cultures.
- Cultural competence
- We have established a team working on the issue of holidays and the way they should be referred to at Technion.
- The academic year was opened with an important meeting of all haredi students and with all employees in charge of their welfare.
- The counselors in the unit for the advancement of students went through a short course in spoken Arabic.
- There is a course in Arabic for Technion staff planned in the summer.
- A signage pilot is planned to take into consideration multi-cultural aspects.
- Training programs



- Prof. Hossam Haick and the Israeli program Collective Impact for Arab Employment (Collective Impact) are introducing talks to several faculties regarding bias and the characteristics of Arab students.
- We are proposing to each faculty an individualized training program for staff members to learn about the multi-cultural society in Israel.
- The Faculty of Medicine is planning a specific training program for staff and students, on cultural competence and working as doctors with all patients.

## 2. The Academia Graduate

What kind of graduate does the Technion want? How much awareness and knowledge about diversity and multi cultures does he or she have?

- A photography contest with the subject of “living together in the Technion” has been announced.
- We are planning to screen films dealing with the different sectors in Israel.
- The Faculty of Architecture and Town Planning has a course in co-existence is dealing between Arab and Jewish students.
- The “good deeds day” will be dedicated to activities in places that represent co-existence and Israeli Hope.
- There is a demand for more courses in spoken Arabic.
- Lectures for staff members are planned to introduce diversity at Technion.
- Information is being delivered about different cultures throughout social media.

## 3. Academia – Connection to Employment

- There is strong co-operation with Collective Impact including a pilot in three faculties on employment of Arab graduates.
- Students are being prepared for interviews and are being taught how to write a resume.
- Meetings with different companies and representatives from industries are held to introduce professional employment to the Arab students.

Last but not least, for combining all the above activities and raising the awareness all over the Technion we are planning the Israeli Hope events during Wednesday breaks, where we will conduct several artistic and social activities that represent the concept, such as a musical performance, a public “kahoot” game, a food-court and more.

## Undergraduate Studies

All the activities carried out at the Office of Undergraduate Studies aim at fostering excellence among our undergraduate students. Main activities carried out in the 2017-2018 academic year are laid out below:

### Preparation for studies at Technion

In line with the recommendations of the Committee Examining the Curricula Structure and the Study Load in the Technion (2013), we focused on the implementation of Section 5: Students' unpreparedness for studies at the Technion.

Specifically, to ensure proper preparation of our students for their studies at Technion, starting in 2019, the admission criteria to Technion will require a 5-point matriculation exam in Mathematics (the highest level of high school Mathematics) with a minimum grade of 70 (out of 100). This criterion was set based on a rigorous data analysis that clearly indicated that students who were accepted to Technion with 4-point matriculation exam in Mathematics (about 5% of freshmen) are expected to fail. It is important to note that this criterion stands in line with the Ministry of Education's message of fostering excellence in the STEM subjects.

In addition, in line with the committee recommendation to strengthen and revamp the preparatory course listings, the on-line Mathematics preparation course was opened to the public without fee. Thus, all the prospective students, who were accepted to Technion, can prepare themselves towards their studies. In addition, the Center for Pre-University Education will strengthen and update all the preparatory courses in Mathematics and Physics and will offer a preparatory course for those who took the 4-point matriculation exam in Mathematics to close the gap.

Further, the Office of Undergraduate Studies uses several channels (e.g., the Student Union) to deliver to the prospective students the importance of proper preparation for their studies at Technion and encourage them to prepare themselves before they start studying.

### The Ladder program

The Ladders (SULAMOT in Hebrew) program, launched this year, aims at exposing the Technion undergraduate students to the research carried out at Technion. Ladders was initiated based on our finding that the majority of the cohort of undergraduate students are not familiar with the advanced research carried out at Technion and, as a result, many of them do not consider continuing to graduate studies. This fact has a long-term consequence on the future generation of Technion researchers and faculty members.

The Ladders program has many advantages. From the student perspective, the explicit attention to the integration of research skills in the undergraduate programs, not only benefits the students in the short term, but also equips them with essential skills required in the 21st job market, characterized by uncertainty, creativity, teamwork, technological changes and globalization. Thus, the research

experience that the students will gain in their undergraduate studies will widen the students' range of future professional opportunities and enhance their professional skills and development.

## Participation in the Job Fair

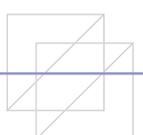
The Job Fair takes place at the Technion twice a year. Dozens of companies from industry offer undergraduate and graduate students professional jobs in the industry. This year (2017-2018), the Technion started participating in the Job Fair offering the undergraduates professional research jobs.

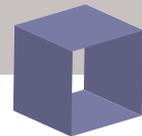
The faculty members understand the potential of this opportunity for finding graduate students. For example, in the Job Fair that took place in December 2017, fifty faculty members offered research work (with salary) to undergraduate students. Further, in order to foster interdisciplinary research at Technion, we promote the message that it is possible (and if appropriate, recommended) to hire a student for a research work not necessarily from the department to which the faculty member belongs.

In the April 2018 Job Fair, the Technion School of Graduate Studies and the Technion Technology Transfer unit will join the Technion booth to further publicize that a wide range of opportunities exist at the Technion for professional development.



Student Job Fair





## New elective (MALAG) course – Exposure to research at Technion

This course will be offered to all undergraduate students each semester. In the course, every week, two faculty members present their research. Faculty members from a variety of faculties volunteered to present their research in the course. The faculty members offered to integrate in their talk a short presentation of one of their graduate students to tell his or her experience as a graduate student. The idea is to enable the undergraduate students to hear from the perspective of a peer the meaning of being a graduate student at the Technion.

In the long-term, we believe that the model Ladders has the potential to revolutionize science and engineering higher-education, in a way that creates a community of practitioners in the university, which includes undergraduate students, graduate students and faculty members, who interact on a regular basis on matters related directly to the core of the university – research.

**A survey among freshmen.** A comprehensive survey, whose aim was to explore the background of Technion freshmen and their decision making process in choosing to study at the Technion, was distributed to the 1800 freshmen who started studying at the Technion in October 2017. Five hundred and fifteen (515) freshmen answered the survey. The data analysis revealed many informative insights, among them we mention two:

- 26.6% of the cohort of freshmen students participated as high school pupils in a learning framework for gifted youth (compared with 2% on the national level). To promote this trend, the head of the Department of Giftedness and Excellence in the Ministry of Education and his staff were invited to visit the Technion. The visit took place May 7, 2018.
- The majority of freshmen (56.7%) decided to study at the Technion only when they were considering what and where to study (compared to 22.5% who declared that they always wanted to study at the Technion and 20.8% who indicated that they decided to study at the Technion in high school). We also found that many students belonging to this majority live in the center and south of Israel, a population that the Technion wishes to attract and to enlarge its portion in the cohort of undergraduate students. As a result, two actions have been taken so far:
  - a group of high school principals from the center and south of Israel was invited to a one-day workshop at the Technion



Graduation Ceremony 2017

- the Marketing Department allocates more resources to attract candidates who are in the 20+ age group and are in the stage of life in which they consider their professional career.

## Technion excellence in national and international surveys

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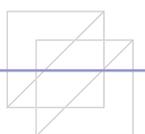
Technion excellence is reflected in both national and international surveys:

- In a national student survey, which checked students' satisfaction in their institute, the Technion ranked first among the Israeli universities.
- According to a Times Higher Education survey, Technion is the world's leading academic institution in preparing students to take top positions in the digital revolution.

## Students with disabilities

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A physical education group is planned for students with physical disabilities to enable them to participate in physical education courses from which they are exempt.



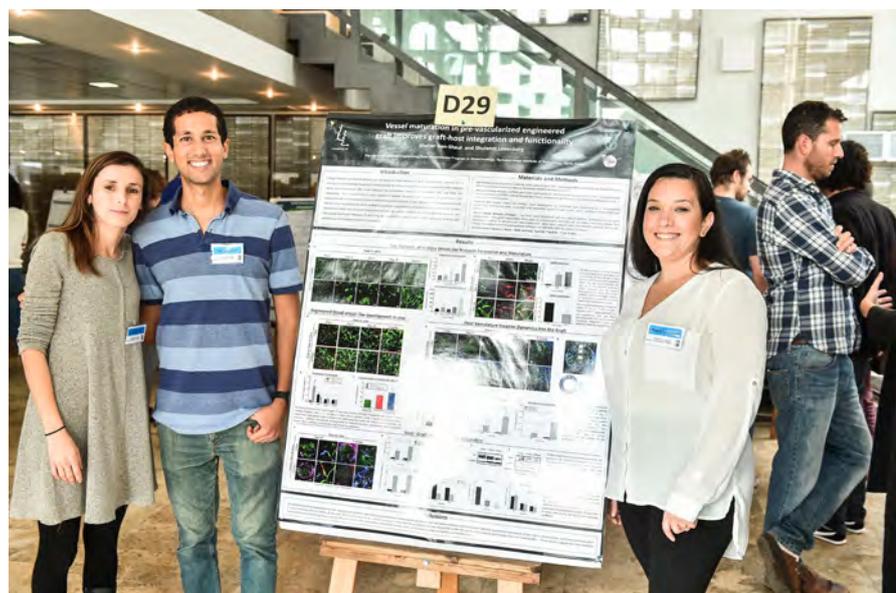
## Irwin and Joan Jacobs Graduate School

### New Study Programs and Specializations

New specializations in the Master of Business Administration (MBA) were approved: Big Data and Business Intelligence, Innovation and Entrepreneurship, and the Azrieli Start-up MBA. New specializations in the non-thesis Master program of Industrial Engineering and Management were also approved: Quality and Reliability Assurance, Electronic Markets, System Operations, and Behavioral Economics. Two new degrees in this faculty were also approved: MSc in Data Sciences, and ME in Data Sciences and Engineering. A new degree in the faculty of Biotechnology and Food Engineering was approved: MSc in Biotechnology and Food Science.

### Cooperation with Universities and Institutes Abroad

The Guangdong Technion-Israel Institute of Technology (GTIIT) campus was recently opened in Shantou, China. The procedures associated with graduate studies in GTIIT were established. To date there are 10 leading universities abroad with whom there are signed Dual PhD agreements. Recently an agreement was signed with Paris Sciences & Lettres –PSL University. We are currently in the midst of negotiations with another university from France and are getting more requests that are carefully considered before negotiating toward signing such an agreement.



Jacobs Graduate School Poster Day

## Teaching Graduate Courses in English

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During 2017, the Dean of the Graduate School held a campaign to promote teaching graduate courses in English. It was fruitful, as all the faculties at Technion are now committed to teach advanced graduate courses in English.

## Changes in Graduate School Policies

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During 2017, several major changes were made in the Graduate School policies and regulations. Two major changes were: (a) A revision in the rules concerning the duration of scholarships for graduate students, mainly to allow more study time in all degrees. (b) The conditions for embarking on the direct PhD track have been enhanced; this revision required changing the Technion bylaws.

## Admissions

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Semester	Master with thesis	Master without thesis	Doctor (PhD)	Non-degree	Total
Fall 2015	294	479	135	6	914
Spring 2016	162	124	136	7	429
Fall 2016	318	472	129	3	922
Spring 2017	134	110	11	2	257
Fall 2017	332	363	140	6	841
Spring 2018	129	104	17	1	251



## Technion International and Strategic Projects

### Guangdong Technion Israel Institute of Technology (GT)

On December 18, 2017 in the Jinping District of Shantou City, the official and festive inauguration ceremony for the new Guangdong Technion Israel Institute of Technology (GT) campus was held in the presence of Technion leaders, faculty, staff and guests as well as dignitaries from Israel and the local and provincial governments of Shantou and Guangdong, respectively. The 100,000 square meters of campus buildings, as well as the attractive landscaping, were completed in the two years since the cornerstone laying ceremony in December 2015. A brand new poster exhibition entitled Technion Wisdom was especially prepared for this opening, highlighting the contributions of Technion to science and society, and attracted much attention during the opening.

The ceremony followed the achievements of the previous months during which 216 Chinese freshman students started their preparatory studies in August 2018. Two thirds came from cities in Guangdong Province – the major investor in the new university – and the rest from 11 other provinces of China. In October, the students then continued on to their first semester of studies and have since completed their first semester examinations. After the Chinese New Year break in February, all 216 returned for their second semester. They are studying in three Technion degree programs – Chemical Engineering, Biotechnology and Food Engineering, and Materials Engineering. Reports from their teachers who came from the Technion are that the scholastic ability of these students is



Inauguration Guangdong Technion Israel Institute of Technology

comparable to that of regular Technion students, although their mastery of the English language is not uniform and is a factor in preventing some from excelling.

As of the writing of this report, 12 professorial appointments have been made for tenure-track positions at Guangdong Technion at the Full, Associate and Assistant Professor levels. As well as this, several research scientists were appointed to manage equipment laboratories and support research and teaching activities. Recruiting professorial faculty is the main challenge for a new research university and GT's faculty are recruited and appointed according to Technion's standards and procedures. As well as academic considerations, the leadership of GT also has to ensure that appropriate health and English language schooling are available for international faculty and their families.

Another immediate challenge is completing the laboratory infrastructure – involving the installation of air-conditioning and fume hoods in both the teaching and research laboratories. The latter was delayed due to several issues concerning safety and quality requirements, but is now on track after a formal tendering process.

We are also considering the future development and management of Guangdong Technion – as it moves from a project to an operating university. There is a need to emphasize GT's primary *raison d'être* as a research university, by establishing research centers that will attract leading faculty who will also contribute to undergraduate teaching. This re-orientation has to be coordinated with the Provincial Department of Education and is a major goal for the current year. Under the leadership of Distinguished Prof. Aaron Ciechanover, we are also adapting the organizational structure to reflect this change of emphasis, as well as to reflect more closely the academic administration structure of the Technion.

Plans are also under way to bring the first cohort of students to the Haifa campus, each for a semester, during either their 3<sup>rd</sup> or 4<sup>th</sup> years. The goal is to not only provide these students with the benefits of an international educational experience in Israel, but to also afford Technion students and faculty opportunities to benefit from their presence on campus through cooperative projects and research internships. Conversely, we expect some of our Technion students to spend a semester abroad at GT, as they will have the opportunity to take a full Technion semester while living in and experiencing Shantou and China in general.

## The Jacobs Technion-Cornell Institute (Jacobs)

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In 2010 Michael Bloomberg, Mayor of the City New York, launched a competition for a new applied science and engineering campus in the city. The intent of the campus was to increase the graduate-level talent pool for the tech industry, help diversify the New York City economy, and drive the creation of new digitally-enabled products and companies in New York and around the world. Cornell University (as lead) and Technion (as partner) together won the competition, and in late 2011 announced the establishment of Cornell Tech – a new graduate school intent on developing pioneering leaders and technologies for the digital age. Cornell Tech operated for several years in the Google building in Manhattan, and moved to its new campus on Roosevelt Island in July of 2017. The official dedication of the high-profile, modern new campus was held in September, 2017.

The Joan & Irwin Jacobs Technion-Cornell Institute (Jacobs Institute), created in 2013 subsequent to a generous founding gift by Joan and Irwin Jacobs, is a cornerstone of Cornell Tech. As a partnership of two world-class academic institutions – Cornell and Technion – the Jacobs Institute places excellence in research and education at the top of its priorities. It participates in Cornell Tech's overall mission of creating pioneering leaders and technologies for the digital age, with significant attention to external engagement of faculty and equipping its graduates for the highest-quality, highest-demand industry jobs. The Jacobs Institute constitutes a third of Cornell Tech in various metrics, including number of faculty members, students and budget.

The Jacobs Institute is charged with pushing the emerging frontiers of the digital age through out-





of-the-box programs and experimentation, and bringing a global perspective to the campus as a whole. Jacobs' "academia unbound" approach is enabled by the Technion-Cornell partnership and by Jacobs' unique legal status as a separate Non-Profit. These empower the Institute to try new things, pushing beyond the traditional comfort zone of academia, and learning from failure as well as success. The global perspective includes first and foremost building comprehensive collaborative relations between Technion and Cornell. Other areas in which the Jacobs Institute leads the way for Cornell Tech are in its emphasis on transdisciplinary research, research and educational engagement with critical application domains, and efforts that create value for the common good.

The Jacobs Institute now has five regular faculty members, one Fellow on a three-year rotational visit from Cornell, and a director, who is also a member of the faculty. We are now in the middle of the annual recruitment season for additional faculty members. We expect the Jacobs Institute to recruit 1-2 new faculty members each year; as per our Founding Agreement, about half of our faculty have Technion as their academic home. Of the current regular faculty, three have Technion as their academic home, while the other two are members of Cornell's Information Science Department.

In the academic year 2017-2018 the Jacobs Institute has continued to offer two concentrations within its Master of Science in Information Systems degree program: Connective Media and Health Tech. The Jacobs MS program is a two-year, dual degree program: students are both Technion and Cornell students and receive degrees from both institutions. The first cohort of Connective Media students consisted of a dozen students and graduated in May 2016. The second cohort of 21 Connective Media students and the first cohort of half a dozen Health Tech students completed their second year of studies and graduated in May 2017. The current first-year class is 45 strong, resulting in a total of 73 across both classes of Jacobs MS programs. We are now in the process of evaluating and admitting students for the academic year 2018-2019; applications are up and we expect to continue to grow. Work is also now underway to develop a possible third concentration focused on the integration of digital technology and the physical world, with possible focus on the urban built environment. If all goes well, this will result in a new MS program to be first offered in the Fall of 2020.



Opening Cornell Tech



As part of their education, many Jacobs Master's degree students spend two weeks in January in Israel, on a trip combining education, hands-on projects, and a general introduction to Israel. This past January the students spent multiple days at the Technion working on a variety of projects, including a multi-day design workshop with Prof. Ezri Tarazi and his students. They also visited Sheba Hospital to discuss innovation in health and medicine, and met with venture capitalists and entrepreneurs. In addition, they participated in a sightseeing and educational tours of Jerusalem, Masada, and the Dead Sea area, together with more than 70 MBA students from Cornell Tech. This year's Jacobs group was quite small (8 students and several staff) and we are working on revising the curriculum and our "marketing" to improve the uptake among Jacobs students next year.

Our Runway Startup Postdoc Program is a unique program allowing aspiring entrepreneurs – with PhDs – to convert deep technology into impact on the world. This "translational tech" program is a novel combination of an academic postdoctoral experience and a startup company incubator. We are now educating our fifth Runway cohort and evaluating applications for the sixth. Of the first cohort, which started in January 2014, we have two companies that have raised considerable funding (one founder is a Technion PhD), and both have launched deep-technology, high-impact products. Additional companies of later cohorts are also showing evidence of potential success. This program continues to evolve, innovate, and push out of the comfort zone of academia, in line with the Jacobs Institute vision. Runway companies now have over 70 employees (mostly in the US and Israel), and have raised total funding of more than US\$20,000,000.

### **Governance and Management:**

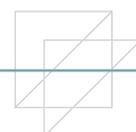
The Jacobs Board of Directors, consisting of four senior people from Cornell and four from Technion, meets regularly to oversee Jacobs direction and activity. A Finance and Audit Subcommittee provides professional support in those areas. Our Steering Committee continues to follow Jacobs' progress closely and provide advice on strategy; the committee has 11 members, with three new members added over the last year, replacing two who had stepped down. We continue to develop academic and administrative processes that will support our mission, emphasizing cooperation between Cornell and Technion. There is still much to design and build in this direction, since the Jacobs Institute is a unique entity in the academic world. One significant step in this direction is the hiring of an Assistant Director for Operations, to assist the Jacobs Director in a wide variety of operational areas. A search for that position has yielded an exceptional candidate, who we expect to be joining the institute in April.

Prior to joining the Jacobs Institute, the current Director, Ronald Brachman, held leadership positions in Bell Labs, AT&T Labs, DARPA and Yahoo Labs, and was responsible for recruiting for and growing multiple role-model research organizations. Brachman's appointment is with Cornell, and following the terms of the agreement, the Chairman of the Board of the Jacobs Institute is the Technion Senior Executive Vice President, Prof. Adam Shwartz.

### **Development:**

We are evaluating our next steps with regards to academic programs and concentrations; this is informed in part by our ability to recruit academic leaders – faculty members – who will create, launch and run new academic programs. We are working to develop resources to support the necessary growth. These include the following:

- Tuition, mostly from the Master's program, which is becoming a large fraction of our resources as we grow.
- Philanthropy (both Cornell and the American Technion Society are involved), which remains a challenge; in the past year we have secured generous new funding for a Professor of Practice position and for the effort to develop the third hub.
- Grants, which typically in the US provide a substantial part of the resources of universities.
- Commercialization, through the Runway Companies; this is in its infancy, but we are already seeing some small growth in value, although no direct revenue yet.





The Jacobs Institute has established itself as a unique academic entity. It continues to develop and evolve, establishing its identity and activities, and growing in size. Using an appropriate high-tech metaphor, we have launched an academic startup, and we are starting to work on scaling up and stabilizing key activities, while keeping in mind our role as the drivers of change for Cornell Tech, Technion, and Cornell.

## Technion International (TI)

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Technion International (TI) promotes the multicultural and global nature of Technion. The Technion is now in the middle of deliberating its overall internationalization strategy, considering both its activities on the Haifa campus as well as its interaction with the overseas campuses in New York City and in Shantou, China. This process has been partially supported by the Council of Higher Education, and the results will determine the role of TI and the range of activities that TI will be responsible for on and off the campus.

Currently, TI handles the development, management, and marketing of programs involving studies and visits of international students at the Technion and also manages the Technion student exchange program, allowing Technion students to spend a semester or a year abroad, and hosting international students who spend a semester or a year at Technion. In addition, TI takes responsibility for their welfare and organizes social and cultural activities for the international community on the campus. TI also oversees academic agreements between Technion and international universities, as well as Technion membership in multi-university and multi-country umbrella organizations.

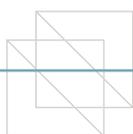
This academic year TI marketed and managed the recruiting for two 4-year English language undergraduate degree programs – in Civil Engineering and in Mechanical Engineering. The total number of freshman students enrolled in these two programs in 2017 was 51. As part of the preparation for the Guangdong-Technion programs, two other 4-year English language degree programs – one in Chemical Engineering and one in Biotechnology and Food Engineering – are also currently running in their second and third years. Altogether, in these 4 “international” degree programs the current enrollment is 184 students. International students who started their studies in any of the full time TI programs in English can opt to transfer into one of the regular (Hebrew language) programs of the Technion, if their grades in their studies in English are excellent, and they have sufficient mastery of Hebrew.

This past year TI piloted a “*Gap Year*” program – a year between high school and college for international students. The pilot helped to determine what kinds of academic offerings, together with other Israeli experiences, might attract high school graduates to spend a year in Israel, including acquiring some academic credits during one semester at the Technion. Based on this experience TI will redesign this program.

In 2017/18 Technion maintained academic collaboration agreements with 232 universities in 41 countries and 36 medical school agreements. Technion maintained membership in umbrella organizations including CLUSTER (Consortium of Leading Universities of Science and Technology), GE3 (Global Engineering Educational Exchange), CMU (Community of Mediterranean Universities) and IAU (International Association of Universities). In the past two years, TI has been instrumental in the development of the Guangdong-Technion program. A survey was conducted amongst faculty in order to better define the types of cooperation of value to the faculty. Based on the results, we discovered the countries, research fields and institutions of special interest.

In 2016/17 (the last academic year for which complete data is available), Technion hosted a total of 661 international students. This includes 184 students in full-time TI programs (BSc in English in Civil Engineering, Mechanical Engineering, Chemical Engineering and Biotechnology Engineering); 62 study-abroad students and 72 visiting research students, and 152 students in one of the full-time graduate programs. In addition, 191 students participated in one of the TI summer programs.

Technion International also offers several short-term programs in English: A Summer School of



Engineering and Science allows international students primarily from India and China to spend 4 weeks studying one or more Technion academic courses. In the summer of 2017, 170 international students participated in the Summer School of Engineering that TI offered, and 21 international students visited Technion for a Summer in Entrepreneurship and Innovation.

Two spring semester programs are managed by TI, one allows French students to spend a semester studying at Technion (PREPA, sponsored by UJA); a second allows MIT students to spend a semester conducting research in one of the Technion labs (MISTI, sponsored by Technion donors). During 2016/17 we hosted 28 PREPA students and 5 MISTI students. Moreover, TI provides (non-academic) support to postdoctoral Technion visitors, their families, and their hosting Technion faculty members, and to international graduate students. This support is coordinated with the Vice President for Academic Affairs and the Dean of the Irwin and Joan Jacobs Graduate School who are responsible for the academic appointments and graduate student admissions, respectively.

In recent years, TI has participated in several multi-university programs sponsored by the Israeli Government. TI hosted over 450 students from China and India, with funding provided by the Planning and Budgeting Committee (PBC) of the Israel Council for Higher Education (CHE). In addition, TI participated in an academic program sponsored by the European Union, the EMAIL III Erasmus Mundus Program which provided funding for student and researcher mobility. In the 2017/18 academic year, Technion applied to 17 Erasmus plus mobility agreements and 3 Capacity Building projects.

The Technion outgoing Student-Exchange program allows excellent undergraduate Technion students to spend a semester studying abroad. In 2017/18, 56 Technion students spent a semester in one of our partner universities in Europe, North America, South America, Australia, and Asia. 80 Technion students participated in the IAESTE summer internship program, which allows students to spend a summer working in another country in their field of study.

An initiative sponsored by the generous support of the Neubauer family allows TI to promote Technion as a destination for study abroad for US students. This year we focused on two main courses of action: recruiting groups of students from targeted universities; and spending more resources to recruit students for our Summer & Internship programs. As part of our strategy to promote our program within selected target audiences, we believe that “faculty led programs” provide a great channel for us to promote the Neubauer Study Abroad Program. The proposed model is to have a group of students coming from a leading university for a 2-week academic program provided by their own university, followed by our program of internships and TI courses. We currently have signed agreements for summer 2018 with the University of Florida and Lehigh University.

## Pre-University Education Center

The Center for Pre-University education consists of two branches: the Unit for Pre-Academic Studies and the Youth Division, both of which hold a great deal of annual activities with the objective of attaining scholastic excellence in the domains of science and technology. Students participating in the various programs are focused on the goal of pursuing the study of Engineering. The unit offers various programs related to Science and Technology for high school pupils.

The main function of the Mechina unit is to provide second opportunity for students interested in academic studies. Most of the students (80%) are supported by the state and philanthropic bodies.

### Special Programs

**Achievement (Hesegim) for High-Tech**– This program provides fully paid engineering studies at Technion. Of more than 200 applicants, 131 students started to study on October 2017.

**Ultra-orthodox (Haredim)** – The Technion has one ultra-orthodox class (22 students), at the main campus (the class in Bnei-Brak Haredim College in Bnei Brak was not opened). The program consists of six months pre-preparatory program (Kdam Mechina) followed by ten months of preparatory course (Mechina). The program is supported by the government and Technion. Tuition and pocket money are provided to ease the pressure on students with families.



Haredi student panel

**A Future in Industry (Atidim La'ta'asyia)** – This program consists of students from the periphery that completed their mandatory military service and hold matriculation diploma. This is a 12 month program, 29 students participated in 2017, all of whom were supported by Technion "Atidim" program that is supported by the Rossman Foundation.

**Atidim** –Students in this program are high school graduates from peripheral regions that hold Matriculation and Psychometric Certificates, but their grades are not sufficient. In order to be accepted they are required to take an additional year of preparatory course. 48 students participate in this program. They are supported by "Atidim" under the auspices of the Ministry of Defense. Because of their young age (18), the students are mentored by military and Technion supervisors.

Most of Mechina students are in regular classes. Students in these classes are Jewish, minorities and new immigrants.

Each year on average 65% of our students successfully complete the Mechina with grades that enable continuation in Technion undergraduate studies. The other students either repeat the course or apply to other universities.

**Other Courses** – In addition to the above, PUC provides the following courses; 1) Basic physics 2) Refresher courses in physics and mathematics for freshmen, 3) "Step before the others" for non-Hebrew speakers and 4) Hebrew "Ulpan" for new immigrants.

## **The Harry and Lou Stern Family Science and Technology Youth Center**

The Harry and Lou Stern Family Science and Technology Youth Center focuses on making Science and Technology attractive to junior and high school pupils. The activities take place at the PUC building at the Arie and Jacqueline Carasso Youth Wing. This wing contains nine laboratories, modern classrooms and the Amos and Shoshana Horev Auditorium. This year pupils have taken part in more than 35,000 learning days in a variety of scientific activities.

## **Additional Special Projects**

**Odyssey Program** - This Program was inspired and endorsed by the late President Shimon Peres, as a path to promoting scientific, engineering and technological excellence in Israel. The program identifies exceptionally brilliant and creative 8th grade pupils, along with social commitment. They study at the Technion one-and-a-half days a week for a four-year period. This year 77 students participated in this special program.

**Alfa Program** – This program is an innovative program for gifted students in high school (9th grade graduates) which facilitates their participation in the world of contemporary scientific research. The program was designed with the aim to provide for the specialized needs of gifted students, by enriching their scientific knowledge, exposing them to scientific research at a high level, and providing them with the skills required to formulate their own independent scientific research and implement it at a level consistent with academic standards. The concept underlying the program is to offer gifted students a meaningful intellectual experience, combined with social activities (and appropriate emotional support). During the program, the students learn to cope with intriguing intellectual challenges, and are involved in participatory social activities with gifted peers from all over the country. The students write a research paper as part of the program, which can substitute for a matriculation examination in one of the intensive-level science subjects (5 study units), or be counted independently as a 5-unit subject on the matriculation certificate. This year 76 students participated in this special program.

**SciTech** - This annual international research summer camp for 11<sup>th</sup> and 12<sup>th</sup> graders, held at the Technion, is now entering its 25<sup>th</sup> year. This is a once in a lifetime opportunity for gifted pupils to experience serious research opportunities guided by top-notch Technion researchers. The 60 participants in summer 2017 from 12 different countries also enjoyed the sports facilities at the Technion as well as touring Israel.





**TeLeM** - Technion Promotes Mathematics - The TeLeM program is a joint program with the Faculty for Education in Science and Technology. Its objective is to strengthen the potential of children from sixth grade and up to study the highest level of Mathematics, to enhance their understanding of the subject and finally to encourage them to apply to the Technion. This is the 18<sup>th</sup> year of the program's operation. 800 pupils participated in this program from six schools in Northern Israel. Graduates of this program in the 11<sup>th</sup> and 12<sup>th</sup> grades are offered a chance to participate in academic studies at Technion within the special framework for gifted high school students.

**Program for Integrating Exceptional High School students into Technion Studies** - This program concentrates on the development of exceptional high school students in order to prepare them for academic studies at the Technion in conjunction with their high school curriculum, and allows them to receive credits toward an academic degree. This year more than 200 students participated in this special program. The program consists of "from high school to Technion" program which is carried out in cooperation with the Faculty of Mathematics. This program includes a cooperative effort with the Faculty of Chemistry in the framework of the "Archimedes Program".

**The Ort - Technion Classroom** - This program is a joint effort between the Technion and Ort Schools for outstanding pupils. 8 classrooms operated in 2017 in the framework of the program with a total of 240 pupils. The program maintains a follow-up of the pupils from 7<sup>th</sup> to 10<sup>th</sup> grades until they enroll as full time Technion students and includes preparatory courses for academic studies such as scientific research skills, logical thinking, scientific and mathematical thinking, introduction to the Technion and academic courses in biology. Some of the high school participants will be admitted to the Technion as regular students in a special early-registration process for gifted students.



## Other Youth Advancement Programs

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The Center for Pre-Academic Studies sponsors several other outstanding programs aimed at enhancing academic potential among a variety of groups. Some are sponsored jointly with other organizations and institutions and cooperate to make a difference for many talented and disadvantaged groups of junior and high school students in their aptitudes as well as their attitudes towards the study of Science, Math and Technology.

**Mathematics Summer Camp** - A two-week camp for 9<sup>th</sup>–11<sup>th</sup> graders, in cooperation with Technion's Faculty of Mathematics and the Youth Activities Center, focused on advancing the level of talented pupils. This year 27 students participated in the Summer Camp.

**Ofanim Science Program** - This program, which was launched last year, is jointly sponsored with the Ofanim Organization and is designed to encourage scientific and technological studies for 5<sup>th</sup> and 6<sup>th</sup> graders in outlying towns. There were 100 participants this year from Tiberias and Migdal Ha'emek that took part in activities held in the Technion Youth Laboratories as well as in a bus that has been constructed as a Robotics Lab which travels to outlying towns.

**Summer science activities** - Special intensive summer study lasts two and a half weeks for 5<sup>th</sup> to 12<sup>th</sup> graders from all over the country. This is aimed at familiarizing participants with academic science studies and with Technion. This year 920 students participated in the summer activities in 48 different groups.



## Student Affairs

The Dean of Students deals with issues relating to the welfare of Technion students.

The Office of the Dean of Students manages six professional units whose responsibilities are to support and promote the advancement of students. These include the Unit for Personal Assistance, the Beatrice Weston Unit for the Advancement of Students, Professional Career Unit and IAESTE, the Fried Counseling Center, the Unit for Social and Cultural Activities and the Student Housing Unit.

### Special Projects

Support Center for Students with Disabilities is equipped with up to date accessible equipment to match the special needs of students with disabilities.

Haredim (ultra-orthodox) students – There are presently 48 male and female undergraduate students from an ultra-orthodox background at Technion.

Hesegim to High-tech – This is a special new project intended for students who live in Israel's peripheral and economically disadvantaged cities and towns. This year, 50 students started their first year at Technion. The first group began studying at the Technion last year.

Student Housing – All four buildings of the new undergraduate village dormitories have been populated this semester. The students are delighted with the new facilities.



Student trip to Poland

Phillip and Francis Fried Counseling Center –Since April 2016, the center has been temporarily located at the Gross dormitories. Construction of the new facility is planned to be concluded in April 2018. The center will move to the new facility by October 2018.

Scholarships – About 40% of undergraduate students are eligible for scholarships. The maximum amount that can be covered by Technion scholarships is 90% of the tuition fee.

Loans – The Technion offers interest free student loans. Last year we gave loans to 400 undergraduate students.

Reservists –Together with the Technion Students Association this year we started to design a computer code to provide easy access for reservists to receive their benefits and rights – Portal Miluim. With the cooperation of the Students Association every year we organize a special event to honor the reservist students. In the past academic year, we assisted more than 1,000 reservists.

ATIDIM Project – This project in collaboration with the IDF assists high school graduates of low socio-economic background from Israel's peripheral areas. This year, 48 students started the program at Technion.

Students from Ethnic Minorities – A special project has been launched this academic year to assist Ethiopian students.

Rosman Atidim for Industry - The project is aimed to facilitate the absorption of discharged soldiers from peripheral areas and underprivileged background. This unique program assists freshmen students.

Freshmen Mentoring Project - According to the resolutions adopted by the study-load committee, a special mentoring project aimed to facilitate the adjustment of freshmen is carrying on successfully.

Professional Career Projects - This year we organized two technical job fairs with the participation of more than 130 companies.

Technical Training Aboard - More than 80 students took part in internships last summer.

Social and Cultural Activities and “Lively Campus” – A large variety of activities took place on and off the campus.

Community Projects – About 350,000 hours of community service were contributed by approximately 30% of the undergraduate student population, in association with various frameworks such as PERACH – Big Brother Program.

## **Technion Students Association – TSA**

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### **Academic Support**

#### **Additional study spaces in Haifa:**

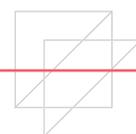
This year TSA launched a project in collaboration with the Technion and Haifa municipality to open study spaces for students outside the campus during the examination periods. Haifa municipality enables the use of public institutions and schools after their hours of operation, so that students can study even when the study spaces at Technion are closed.

#### **Student exchange programs abroad:**

TSA is working to increase the number of students going abroad for exchange programs. Together with the International School and the Undergraduate Studies Department procedures are being drafted to overcome bureaucratic hurdles students face.

#### **Students with academic problems:**

TSA started a program to advise students facing academic problems to enable them to successfully pursue their degrees.





### **Examination Survey Recommendations - Committee for Lecturers and Teaching Assistants:**

The Committee for Lecturers' and Teaching Assistants' Examination Survey submitted its recommendations to the Technion Senate. The Committee's recommendations are now in final discussions and we believe that soon they will be approved.

### **New graduate students orientation day:**

A new graduate students orientation day was held this year.

### **Academic Support Services:**

Remedial Courses:

The Student Association provides remedial courses at nominal costs that are geared to help students understand the material taught in various courses. We plan to offer courses in professional tools (Excel, Matlab, Python, public speaking and more).

Mentorships:

In addition to the mentorship project, in which high-achieving students assist those who need help in physics, chemistry, and computer science, this year the Student Association continued to offer mentoring marathons ahead of the exam period. In the coming semester we expect to add tutoring in and next semester we plan to tutor in algebra and calculus.

### **New Study Spaces:**

The association's study space on the 4th floor will be open 24/7 including weekends. The courses office holds classes of its own in a comfortable learning environment, and the tutoring office has received a permanent room to provide a more organized work area for its mentors.

### **Workbooks and Exam Folders:**

The booklet store located in the Student Union building contains a collection of approximately 600 workbooks and exam folders from the various departments, as well as books written by lecturers and teaching assistants. We recruited a team which promotes more premium booklets in store.

### **Online Video Library**

This year, we began "Problem Solving with TSA", an online library which will contain videos by teaching assistants who cover recent exams in a variety of courses.



Technion students 2018

## **Cultural Life**

### **Reserve Soldiers:**

This year, the Dean of Students Office and the Student Association distributed to all reservists a free ticket to the student festival, free beer and an "active reserve duty" shirt.

### **Family Club:**

The Association continues to hold designated events for the older student populations with families, especially graduate students. Last summer, the Student Association produced a Children's Festival with activities for children, playgrounds and entertainment, all at subsidized prices.

### **Student Festival:**

The Joint Student Festival, produced entirely by the Technion Students Association, is the largest festival in Israel and includes concerts by Israel's top artists. Last year some 18,000 students attended the festival for a nominal fee of less than \$10.

### **Enrichment workshops:**

With help from the Dean of Students' office, the Student Association has held a large number of enrichment workshops, including a wine and cheese workshop, a sushi workshop, and a chocolate workshop. Wednesday afternoon.

### **Wednesday Afternoons:**

Every Wednesday at 12:30 PM, all students take a two-hour break during which no classes are held. TSA organizes activities, such as a large concert on the first Wednesday of the semester, sporting competitions, shows, fairs, organized activities, and market stalls. With the support of the Technion President, a famous Israeli artist appeared on the last day of the school year and from the Office of the Dean of Students, another special day is held.

### **Enrichment Lectures:**

TSA holds lectures once a month thanks to support from the Dean of Students office. These lectures expose students to issues not on the academic agenda, and provide a break from intensive studies.

### **Concerts and Plays:**

Every semester the Students Association makes sure to host quality plays from among the best the country has to offer.

### **Parties:**

Once a month during the academic year, the Students Association turns the campus center into an impressive nightclub.

### **Faculty Evenings:**

The TSA provides help to the various faculty committees or organize a variety of evening programs.

## **Social Life**

### **Environment:**

An array of paper and tin can recycling locations exist throughout the campus. The recycling scheme includes a full student team operating throughout the campus to collect and empty the recycling bins. Other activities included workshops about making products with recycled materials and workshops about medicinal plants.

We are currently working on a green pavilion designed to be the focus of all types of recycling on the campus and a focal point for recycling and sustainability.

### **Helping the Community:**

TSA cooperates with the MDA to organize blood donations on campus, and MDA places blood donation vehicles in all the faculties once every semester and at the Student Union Building on a permanent basis.





With the “Melech” project - computers for everyone TSA repairs laptops and PCs and delivers them to students of limited means. A project was held to collect donated cosmetics from students for women’s shelters.

### **Volunteering:**

In order to expand contribution to the community, the Student Association leads and encourages Dean of Students program: “Volunteering = Eligibility”. TSA also volunteers in a number of Haifa centers, including kindergartens and public parks.

### **Extracurricular Activities:**

The Students Association, in cooperation with the Dean of Students’ office, operates a full array of extracurricular activities such as yoga, Pilates, and kickboxing, for the benefit of students on campus. We have now opened classes in English for students, and a birth preparation course.

### **Shabbat Meals.**

Meals are subsidized and enable students to maintain a traditional lifestyle in a warm atmosphere at Technion. Last year we held the first “Grand Social Shabbat” in which 300 students and faculty members took part. Due to the popularity we have now added a light lunch on Shabbat.

### **Accessibility:**

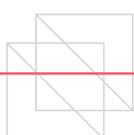
The Association held a special event for students with disabilities, in which other students experienced first-hand the challenges of dealing with special needs.

### **Delegation to Poland:**

In cooperation with the President of the Technion, an independent Technion student delegation went to the death camps in Poland. Students underwent preparation in which they discussed dilemmas regarding Holocaust remembrance. After their return, additional meetings included volunteering at a Holocaust survivors’ center and listening to testimonies followed by a discussion on Holocaust Memorial Day. Students in the delegation came from different backgrounds. TSA held the Zichron Memorial event at the Technion - where Holocaust survivors came and told their personal stories in several locations on the campus in Hebrew, English and Russian.



President’s Concert for Students



## **Social Initiatives:**

Notable events included a hair donation drive for cancer patients, distributing candy on Purim at Rambam Hospital, and food packages for Passover. Also this year, the Student Association held a summer camp for the children of the Neve Paz Community Center during the summer months.

## **Birthright:**

Technion students join Birthright delegations throughout the year. Students help Israeli public outreach and empower the experience of diaspora Jews.

## **Campus Life**

### **Transportation:**

The Green Transportation Campus has taken the following steps: Establishment of bicycle parking spaces in the various dormitories in cooperation with the dormitories office, establishment of a ramp for bicycle self-repair in the Undergraduate Village, the introduction of a cooperative car service to the Technion, the establishment of designated parking spaces in areas adjacent to the dormitories and the campus center, and the Technion, in cooperation with the Ministry of Transportation. It is hoped these initiatives will reduce traffic within Technion, reduce air pollution and reduce the likelihood of road accidents.

### **Authorities Fair:**

The Student Association holds a local authorities' fair during the first week of the academic year and the Spring semester, in which representatives of the local authorities came to provide services to students. Representatives came from the Haifa municipality, the Nesher municipality, the National Insurance Institute, Rav-Kav, Hot Mobile, the Technion security unit and more.

### **Dormitories:**

The Wi-Fi bandwidth was increased from 30 to 100 megabytes in small apartments and from 100 to 200 megabytes in large apartments. Approval was received to bring guide-dogs-in training into the student dormitories.

### **Laundry:**

A new laundry service provider has been chosen and new washing and drying machines, and more laundry rooms were added to the Undergraduate Village and the Graduate Village. It should be noted that the Student Association continues to operate the cheapest laundry system in Israel - only 3 NIS per laundry cycle.

### **Vending machines:**

The Student Association chose a vending machine supplier who replaced the machines in the dormitories with modern machines. In addition to cash, machines can be paid with an ATM or credit card without a service fee.

### **Virtual Wallet:**

Last year the Student Association created a "virtual wallet" which enables students to charge their student card through the internet and use it for photocopying documents and payment at the laundry and beverage vending machines. The cards are embedded with RFID chips.

### **Food:**

TSA continues to lead Israeli academia in food and beverage pricing. The range of eateries at the Shalom Zielony Student Union was improved, with emphasis on lower prices, longer operating hours, larger selections, and improved service. In addition to the food businesses under the full responsibility of the Student Association, the association has been a partner in tenders for food businesses outside of the student union.

### **Printing:**

TSA operates one of the largest printing services in the country with photocopy, print, and copy



facilities in each of the faculties with highly competitive prices. The Association continues to expand these services through scan-to-mail and cloud-printing services.

## Sports

### The Academic Sports Association:

The Academic Sport Association currently operates 115 sports courses worth one academic credit, and 42 sports teams, for which participants receive 1.5 academic credits, in 34 different sports. Six thousand students take part in the teams and the various sports courses. In 2017 yachting and sailing courses were opened.

### Israel's Championships for Academia:

Each year, the sports teams of the Technion Sports Association participate in the national universities and college's championship, in which 32 academic institutions participate. And in the annual summary, the ASA team won first place in general, especially in first place in the men's category and second place in the women's category.

### International championships:

ASA Technion participated in the European Championships with representatives from 24 European countries in the fields of streetball, beach volleyball and chess. In addition, the representatives of ASA Technion represented Israel in the world championship in sports navigation.

### The Technion Challenge:

Last year the seventh annual interdepartmental sports tournament saw thousands of participants from all Technion departments compete in 10 different sports. The winners received the "President's Technion Challenge Cup" and an award of 15,000 ILS to the winning faculties. Scholarships totaling 45,000 ILS were handed out to winners in the various fields.

### Technion Race:

In 2017, ASA Technion held the third annual Technion Race, Technion Challenge. Students, faculty, staff, and workers ran a 5-kilometer course within the campus. Although originally intended as a student event, it has turned into a full-blown sporting-fest with the participation of the academic and administrative staff members. Winners of the race received outstanding prizes, estimated at 15,000 ILS. Special race shirts were distributed this year.



Technion Challenge

### **ASA Championship Israel:**

This championship takes place every year in the city of Eilat and students from 32 academic institutions in Israel take part. The Technion delegation is the largest and has about 250 athletes and coaches, out of approximately 1,700 participants.

### **Scholarships**

Under the auspices of the Dean of Students, scholarships are awarded annually. Last year, 100 scholarships were awarded at a total sum of 100,000 NIS.



## Research

Research contracts signed in 2016/7 by the Research Authority amounted to \$92.8 million. In the last two years, the Technion's research contracts totaled \$96.8 million in 2015/16 and \$83.2 million in 2014/15 (see Figure 1).

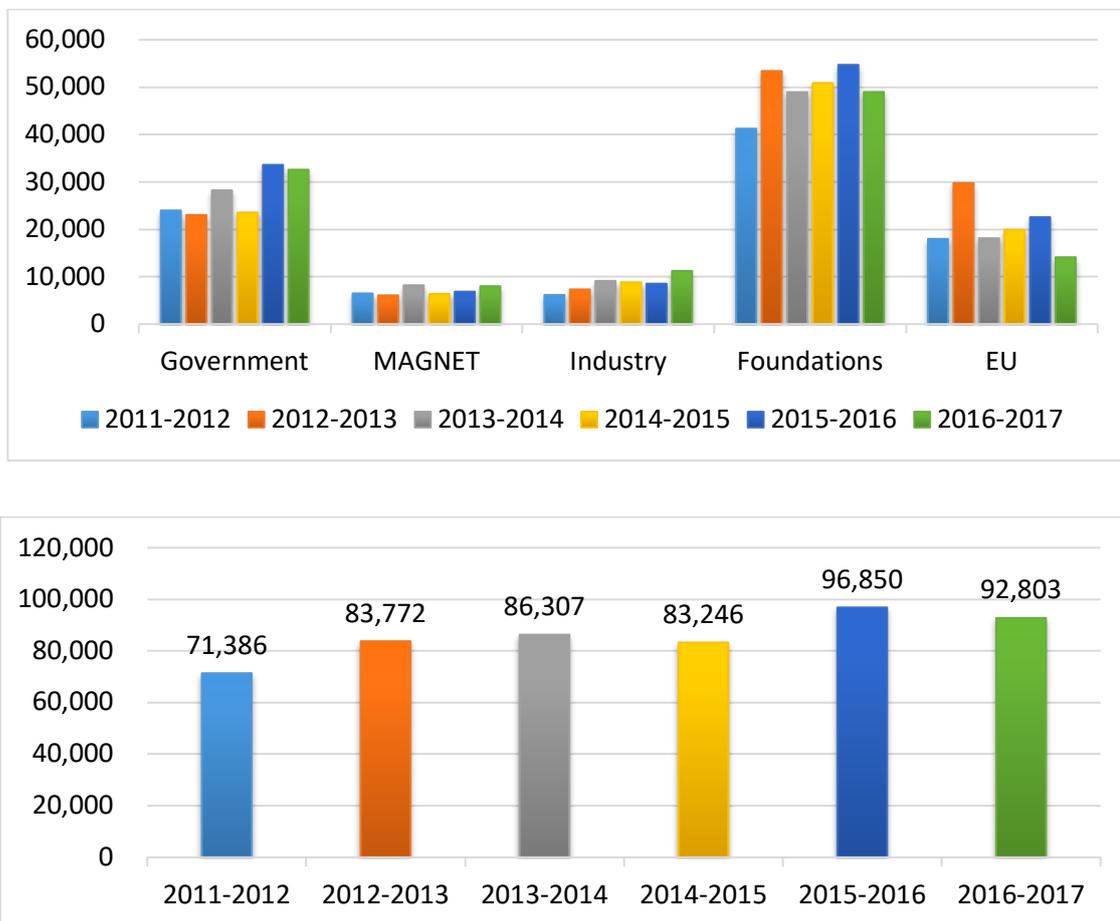


Figure 1: Extramural Sources of Research Funding (Thousands USD)

Activities to encourage the submission of research proposals to competitive scientific funds continue. In the past few years, there has been an increase in submissions to the two main competitive funds (ISF-Israel Science Foundation and BSF-Bi-National Science Foundation) from 161 proposals submitted to ISF in 2015/6 to 206 proposals submitted during 2017/8. From the ISF the Technion received 64 new awards during 2015/6 in comparison to 85 during 2017/8. To BSF there were 95 proposals submitted in 2017/8, in comparison to 65 on 2015/6. From the BSF the Technion received 27 new awards during 2015/6 in comparison to 34 during 2017/8.

On 01/01/2014 the new funding framework (Horizon 2020) from the European Commission was launched. Horizon 2020 is the largest EU Research and Innovation program ever initiated, with nearly €80 billion available over 7 years (2014 to 2020). In the period of October 2016 through September 2017, Technion was awarded \$14.1 million in funding in the Horizon 2020 framework in comparison to \$22.6M during 2015/16, and compared to \$19.91M during 2014/15. This decrease is characteristic to the trend of considerably lower success rates of universities in the H2020 program due to the higher technology readiness level (TRL) required in the majority of funding schemes (except the ERC which funds basic science).

Funding in the past year for projects from the Office of the Chief Scientist of the Ministry of Economics and Planning, was \$8 million, in comparison to \$6.8 million during 2015/16.

## External Aid for Research

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In addition to the external funding from research contracts signed within the framework of the Research Authority, Technion received contributions from donors (for specific individual researchers or for the creation of research infrastructure) for \$23.72 million, and \$16.98 million to purchase equipment for new faculty members. In addition, Technion received assistance from the government for programs for new immigrant absorption (Shapiro and KAMEA) totaling \$3.02 million.

## Internal Technion Financing

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Over the past year Technion allocated close to \$877K to encourage competitive research activities (including internal grants, bonuses for researchers submitting proposals to competitive funds and the promotion of research among new faculty). The sum of \$1.35 million was granted via academic chairs and \$31.65 million was allocated to finance fellowships for graduate students engaged in research. The total investment in research, including all sources (external funding, contributions from donors, external aid, internal funds, and graduate fellowships) amounts to \$170.4 million.

## International and Industrial Collaboration

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### The Umbrella Program (Aachen University, Jülich Research Institute & the Technion)

Last year's symposium was held in Aachen in July 2017 on the topic of "From Quantum Matters to New Materials". This year's symposium was held at Technion in April 2018 on the topic of Energy Conversion and Energy Storage. In 2017 it was decided to initiate an Umbrella Award (starting 2018) to three young excellent scientists from the three institutes. The award provides funding for extended visits to the respective institutes.

### Institutes of Mines-Telecom France

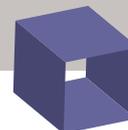
A scientific workshop on Materials Science and Engineering between scientists from Mines-Telecom France and the Technion was organized at Technion in November 2016.

### Collaboration with China

The 1<sup>st</sup> Technion-Shantou Workshop on Recycling of Materials and Environmental Protection was held at the Technion in November 2016. The week-long workshop provided Technion and Shantou scientists the opportunity to interact on potential topics for future collaborations.

### The Technion Center of Excellence in Exposure Science and Environmental Health

This research center was established at the end of 2010. The Technion was awarded \$1 million for



five years from the Environment and Health Foundation for establishing a Center of Excellence: "From Airborne Stressors through Risk Assessment to Health Outcomes". The Center's activities in the past seven years included research in four general areas: exposure to air pollution in the heterogeneous urban environment; the effect of air pollution from agricultural sources on the population of neighboring communities; air pollution within the built environment; and development of tools and methods for remote detection of air pollutants and for analyzing air quality databases from monitoring stations in order to evaluate the level of exposure of the public to airborne pollutants.

The Center directs research in a wide variety of subjects, among them wireless distributed sensor networks for air pollution monitoring, the use of satellite remote sensing of aerosols for environmental management and public health applications, development of advanced models for assessing the effect of traffic and industry on air quality, development of methods for studying residues of agricultural pesticide spraying and brominated flame retardants, establishing a national air pollutant database, and development of a national scale model for estimating the impact of commute on personal exposure to air pollutants.

The Center consists of five Israeli post-doctoral researchers, approximately ten graduate students and a number of faculty members. In the seven years since its establishment, center members have published more than 90 papers in leading scientific journals and were active participants in approximately 130 national and international conferences. Center members raised additional research money from different sources, both competitive (e.g. EU, ISF) and national (MoEP, Mol, MoST). In the last year, 4 students who performed their research within the center graduated (2 PhD students and 2 MSc students).

## Awards

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### The Hershel and Hilda Rich Visiting Professorship in Applied Research

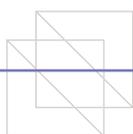
Ms. Renie Carniol, daughter of the late Hershel and Hilda Rich, donated funds for the *Hershel and Hilda Rich Visiting Professorship in Applied Research*. This is in addition to the original program her father founded in 1992. In 2017 Prof. Mercuri Kanatzidis of Northwestern University and a Senior Scientist at Argonne National Laboratories USA, was selected. He was a nominee of the Faculty of Materials Science and Engineering. He spent one week on campus interacting with Technion faculty and students, and gave three lectures on:

- Energy from waste heat and how thermoelectric materials are designed and used
- Halide perovskites as new high-performance semiconductors
- Inorganic chalcogenide solids: from discovery to design and applications

## Significant Agreements

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- The research center in cooperation with Intel, the Hebrew University and the Technion continues its activity. The activities in the center are mainly conducted by faculty members from the Faculty of Electrical Engineering and the Faculty of Computer Science in the field of computational intelligence. Within this framework and in 2016/17 a fifth portion of research grants (9 research grants) was received.
- In August 2016 an agreement was signed between Bank Hapoalim and the TRDF creating a framework of collaboration between the two parties. The Technion Poalim Data Science Center ("T-PADS") was established. The first payment was received in December 2016. The total sum of the transfer will be 1.5 M\$ within 5 years.
- The Technion Industry Liaison Program (TILP) was established in 2017 by the Technion in response to the current accelerated pace of technological transformation. TILP enables a company to navigate the Technion's resources and establish a direct line of communication with Technion researchers in relevant fields. TILP also introduces companies to Technion academic activities (seminars and conferences). A first contract with a Swiss company has been already signed.



## Pre-Clinical Research Authority

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The pre-clinical research authority is a complex operation providing animal research facilities to two different types of researchers, faculty members of the Technion and affiliated hospitals, and commercial companies.

This year the pre-clinical research authority allocated NIS 3.5 million for the ongoing scientific activities of Technion researchers in all the faculties, and at the two campuses. To increase this budget and improve services, a major goal of the research authority is to evaluate the scientific and fiscal activity and in turn devise a strategic plan towards future development of this facility. As part of this plan, we aim to introduce fundamental organizational changes that are needed to accomplish the desired changes. Towards this goal we are taking the following actions:

- Restructuring the organization of the administrative management of the research authority and recruiting a new Administration Head who will manage the manpower and budget of the authority. We have allocated budget for this new capacity.
- While the professional standards of the authority are high, the management side of the authority needs significant improvements. Presently, it is an “intuitive management” that needs to change to a more professional one that plans and carries out the strategic short, medium and long-term goals set out by the academic and pre-clinical authority veterinary leadership. We will introduce state-of-the-art mechanisms to evaluate the success of the various activities. For example, we will introduce and assimilate the use of software such as BookIt and amend the SAP software to enable clever stock management and usage, maximize the use of the operating rooms, etc.
- As part of understanding the fiscal activity of the authority, we have initiated organizational counseling to be performed by a consultancy firm specializing in Industrial Engineering and Management. One of the main goals we have set is to revise the administrative and economic organization, with a special emphasis on separation of the scientific and non-scientific activities (services to companies not affiliated with the Technion).
- As part of advancing the pre-clinical research authority, keeping biomedical research at the Technion competitive, and continuously improving the facilities and services, we plan to bring an international scientific advisory board that will evaluate on-going activities, and provide input on new facilities and services that will anticipate the needs of current researchers and new faculty we hope to recruit.

## Research Institutes

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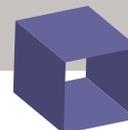
### Russell Berrie Nanotechnology Institute (RBNI)

Several breakthroughs by RBNI researchers were achieved and reported in 2017. The **Helen Diller Technion Center for Quantum Science Matter and Engineering** is evolving out of RBNI and is emerging as a key research platform in the physical sciences.

Some of the key research achievements of 2017 include:

- The first ever topological laser which is based on the concept of topological photonics, a field initiated at Technion by Prof. Moti Segev.
- The first demonstration of Ramsey fringes in a room temperature quantum dot semiconductor, demonstrated in Prof. Gadi Eisenstein’s laboratory.
- The first demonstration of entangled photons on demand generated by single semiconductor quantum dots demonstrated in the group of Prof. David Gershoni.
- The first direct observation of the time evolution of optical vortexes demonstrated in the group of Prof. Meir Orenstein.
- Significant advances were made in a world leading AFM system under development by Prof.





Uri Sivan.

- Significant advances were obtained in the use of meta surfaces to control quantum states; a collaborative effort of Profs. Erez Hasman and Moti Segev.

RBNI supported Technion infrastructure was significantly enhanced with the installation and operation of three major research tools, a state of the art FIB, a new improved Titan Themes HRTEM system and a new cryogenic TEM. These raise the instrumentation level to unprecedented heights and will have a major impact on Technion's research capabilities. RBNI also contributed to the establishment of a 3D printer for biological matter installed this year at the bio engineering department.

RBNI continued to be heavily involved in international collaborations. Countless joint works on issues related to nano and quantum science take place with the most advanced international centers. RBNI and the University of Wuerzburg held the first annual symposium on quantum science in April 2017. A follow up event is scheduled for May 2018.

### **Hiroshi Fujiwara Cyber Security Research Center**

The Technion Hiroshi Fujiwara Cyber Security Research Center was inaugurated in April 2016 and aims to become a top leading cyber security research facility that will contribute greatly to the field. In 2017 the center received a generous gift of \$4 Million from the Japanese entrepreneur and business leader, Dr. Hiroshi Fujiwara, founder and president of Tokyo-based firms BroadBand Tower (BBTower) and Internet Research Institute (IRI). The gift, the first to be received by Technion from Japan, is dedicated to the Technion Hiroshi Fujiwara Cyber Security Research Center. This gift complements a 15M NIS support from the Israel National Cyber Directorate (INCD), support from the Technion and grant funds received from the EU and other foundations.

At the Hiroshi Fujiwara Cyber Security Research Center, faculty members from various faculties explore the weaknesses that endanger computerized systems and propose methods of protection. The center fosters awareness of these issues and holds seminars for engineers working in cyber security in order to broaden their knowledge and keep them abreast of the latest developments in the field. The center collaborates with many Israeli and international industries and is working to expand these collaborations. We invite industry collaboration and host researchers and post-doctorate fellows from Israel and abroad.

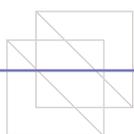
The center manages research grants for researchers and fellowships for graduate students (MSc and PhD), serves as a focal point for scholars, focuses on disseminating innovative knowledge through conferences and international workshops, and deepen awareness of the field via courses, lectures and other outreach activities.

The center focuses on cyber security research such as software and hardware protection, operating systems security, cloud security, protection of IoT (Internet of Things) systems, verification of software and hardware, computer vision, security of autonomous systems, cryptology and cryptanalysis, security and privacy of medical and aeronautical systems, and Industrial control systems security.

This year, the center started to fund research grants for 10 research projects in various security areas and granted fellowships to 8 MSc students and 6 PhD students. Specific areas include industrial control systems security, network security, trusted execution environments, image processing for security applications, side channel attacks, security for medical devices using machine learning for security, cryptanalysis, and more.

As part of the Center's mission, the center organizes annual activities such as Cyberday, Cryptoday, Lightweight Crypto Day and Summer School on Cyber Security. In the past year, the summer school focused on one of the hottest technological topics in the world today: "Decentralized Cryptographic Currencies and Blockchains". The event featured 16 leading experts in the field including:

- Vitalik Buterin, founder of Ethereum, one of the leading and most interesting cryptocurrencies. Vitalik Buterin is a major leader of this field.
- Zooko Wilcox, founder of Zcash, a cryptocurrency that (unlike Bitcoin) maintains user privacy.



- Kathryn Haun, a federal prosecutor from the United States, who has exposed criminals who used cryptocurrencies to fund crimes worth millions on the “Silk Road” website, and FBI detectives who misappropriated the cryptocurrencies confiscated from the same site.
- Prof. Joseph Bonneau of the University of New York
- Prof. Rafael Pass of Cornell University

The event attracted over 600 students, researchers, and industry and government professionals. It aroused great interest among members of the virtual currency community in Israel and around the world. Participants arrived from over 10 different countries, including countries from Europe, North America, and Asia.

## Nancy and Stephen Grand Technion Energy Program (GTEP)

This year the construction of the Nancy and Stephen Grand Energy Laboratories and headquarters was completed. This facility is now fully housed and active. It consists of two central laboratories: the Fuel Cells Research Laboratory and the Hydrogen Technologies Research Laboratory, as well as GTEP’s administrative offices and workspaces for graduate students, postdocs and visiting scientists.

In addition, GTEP continues to operate the following central laboratories:

- The Ed Satell Family Nitrogen/Hydrogen Alternative Fuels Research Laboratory (NHAF).
- The Photovoltaics Central Laboratories (a joint project of GTEP and RBNI).
- The Leona M. and Harry B. Helmsley Charitable Trust Energy Storage Complex.
- The Bioenergy Laboratory.
- Temperature Controlled Greenhouse for Growing Transgenic Plants.

During the past decade, over 60 Technion faculty members have been supported through GTEP’s funding channels among them 18 new faculty members in the field of energy. GTEP support includes seed money grants; graduate student and postdoctoral fellowships; facilitation of events; and the management of the GTEP central laboratories and equipment.

GTEP researchers participated in various national collaborations funded by competitive and philanthropic sources. This year a new call for proposals was initiated within The UConn-Technion Energy Collaboration Initiative. This collaboration will award joint Technion – UConn proposals in the field of energy storage with seed funding for research.

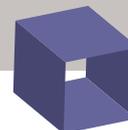
In the 2017 academic year, GTEP’s success included 159 publications in leading scientific journals and 12 patent applications. GTEP researchers received over \$8.7M in external research funds and industrial support for research. This level of external funding and scientific papers would not

have been possible without the infrastructure that GTEP has created on campus. The cumulative funds received from external competitive sources overtook the cumulative funds from philanthropic sources, early in 2017.

GTEP’s unique Graduate Program in Energy Studies is a popular program, both for Technion students and for candidates from other leading academic institutions in Israel. In the 2017



GTEP students at work



academic year, GTEP had 42 registered students, of whom 24 were MSc and 19 were PhD. Of the PhD students, eight are in the direct PhD track. The program's competitive advantage is in its attraction of top minds for energy research. One measure of the students' quality is the competitive external prizes and scholarships won by 15 of them in 2017. In 2017, 14 students have graduated the program. This year we expect an additional 16 graduates.

In 2012 GTEP and the Wolfson Faculty of Chemical Engineering launched an ME graduate study program in Natural Gas & Petroleum Engineering. In 2017, Technion's NG&PE ME Program celebrated the graduation of its third cohort with 50 graduates so far, and in October 2017 the fourth cohort was launched with 17 students.

To further expand its educational activities and support channels in energy research on campus, GTEP has launched the GTEP Fellowship Program for Outstanding Post-Doctoral Fellows. As part of the program, GTEP proposes to support successful applicants with a matching stipend. In 2017 nine postdoctoral fellows won fellowships through this program.

GTEP also supports projects in outreach and general education as an integral part of its global mission. This year, GTEP supported the Technion Formula Student activity. In addition, 14 seminars, lectures and workshops took place in this period under the auspices of GTEP.

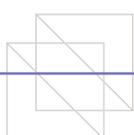
The energy challenge is here to stay and is probably the biggest engineering test humanity will face in the next few decades. We need to enhance and spread significantly power and transportation without detrimental effect on the environment. For continued prosperity, inexpensive and renewable energy sources are needed. Clean and renewable energy sources are vital for our health and well-being. Air and water pollution are linked to breathing problems, neurological damage, heart attacks, and cancer. Dealing effectively with these energy challenges will literally save lives.

The Nancy and Stephen Grand Technion Energy Program (GTEP) is the leading energy research and education center in Israel. GTEP is home to an exceptional cross-disciplinary community of energy scholars in collaboration on the development of enhanced applications for the generation, use and storage of energy for the needs of tomorrow.

In its 10th year of activity, GTEP's focus is on the development of a strategic plan to pivot its activities and redefine its pillars. Presently, GTEP is identifying additional multidisciplinary research areas that could be supported to maximize energy research at Technion. To this end, GTEP is exploring new funding sources for new initiatives.



New GTEP laboratory



## The Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering

The Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering was launched in 2006. Mr. Lokey's monumental gift to the Technion, and the vision behind this- stewarded by Nobel Laureate Prof. Aaron Ciechanover has made possible the establishment of the The Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering.

Engineers and scientists can create scientific advances to the extent or in proportion to the amount and sophistication of their tools. Traditionally scientists explored and experimented and engineers created designed and built tools but these two fields are merging and there are many promising tools coming out of multidisciplinary projects. It was long recognized by Technion management that engineering principles and technologies would eventually be applied to the life sciences. Over the past several decades, the merging of engineering and life sciences has led to new ways of looking at old problems and life sciences have also influenced engineering.

The center was organized in a manner that gradually progressed build from developing a mutual foundation of understanding of different disciplines, (e.g. engineering, physics, computer science, medicine, biology, chemistry) to sharing current research and brainstorming about new opportunities, to identifying the necessary "action items", or developmental steps, required to mature this field. This convergence has led to the emergence of new disciplines in the center such as Biomedical Optics and Imaging, Systems Biology, Synthetic Biology, Bioinformatics and Computational Biology, Metabolomics, Nano-Optics, among others, which are a reflection of how convergence is a serious and increasingly important development in science.

In September 2016 Prof. Roy Kishony took up his appointment as managing director of the Lokey center. One of the center's missions is to position the Technion at the forefront of global research and development at the interface of medicine and nanotechnology.

As the recent explosion of big data is revolutionizing healthcare, this year we launched a new initiative called "Biomedical Informatics – Big Data Science". The main attraction of using big data is that decision-makers will better be able to understand and make decisions about huge scale questions and challenges that were previously unimaginable. We aim to turn massive amounts of genomic, imaging, and clinical data into health breakthroughs where we can build improved health profiles and better predictive models around individual patients so that we can better diagnose and treat disease.

In December we held an international conference titled "Biomedical Big Data Science: Vision, Promises and Challenges". The conference attracted a mix of speakers who covered a wide range of topics – from practical applications of data science in medical care to ethical precision medicine and next generation healthcare. In the course of two days, 24 eminent speakers from around the world shared their latest research findings with the international audience.

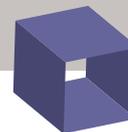
This year we continued our efforts to recruit young scientists from the multidisciplinary community to the President Interdisciplinary Program. We are interested specifically in scientists who are interested in developing and applying new technologies, to develop the center core strengths at the interface of Engineering, Quantitative Sciences, Biology and Medicine. This year we have recruited a young researcher in the field of molecular/genomics neuroscience who brings with him new expertise in acquiring and analyzing data from single-cell RNAseq measurements from brain samples. These novel methods were recently applied to map all cell types in the mouse brain and will further be applied to answer question about the molecular changes occur during memory and learning.

During the past year we conducted several workshops seminars, courses and tutorials to expose the activity and services offered by the center units to the Technion.

Among them:

- Imaris Image Analysis workshop
- Flow cytometry Symposium.
- LS&E user symposium
- We conducted a hands-on crystallization laboratory at the TCSB for Tel-Hai college students.





The Lokey Center continued in 2017 its goal of knowledge dissemination through “The Lorry I. Lokey Distinguished Lecture Series”. This series brings world-class scientists who lecture and meet with researchers and students.

We continued this year to focus on the development of the various units within the clusters: Technion Genome Center, The Infrastructure center (including the Microscopy and Imaging unit, Flow Cytometry unit), Bioinformatics unit and the Technion Center for Structural Biology. We have invested in augmenting these research facilities by means of upgrading and purchasing advanced scientific equipment. The center units that have been growing rapidly over the years are one of the main triggers for the flourish of life sciences at the Technion.

The center allocated this year funds for supporting researchers who wish to upgrade their research equipment and for subsidizing the usage at the center units. (joint project with RBNI)

The Lokey Center team members are highly trained and experienced, fully committed and dedicated to delivering all necessary support and knowledge to the Technion research community most importantly to students, post-doctoral fellows, and others from outside institutions and industry.

### **The Technion Autonomous System Program**

Autonomous Systems represent the one of the major cutting-edge fields of engineering, involving the use of mechanics, electronics, computer science and materials with sensors, actuators and communication capabilities. The objective is to develop intelligent systems that can interact dynamically with the complexities of the real world.

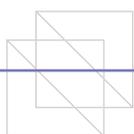
The Autonomous Systems Program was founded in 2008 in order to form a focus for studies in different disciplines, thereby gaining from the synergies and bringing Technion to the forefront of this exciting and essential field. Over 80 faculty members from nine faculties are registered in the program, which is divided into four major centers (air and space systems, ground systems, marine systems and medical systems). We relied on initial donations, enabling a buildup of expertise and infrastructure, to attract later funding from government and industry to sustain the center. The principle we work by is to support research activity and equipment and not “bricks & mortar” construction.

This year we continued extensive activity with several major projects:

- Autonomous Pollination system- we initiated a program to develop an autonomous system for pollinating plants, to help in the worldwide crisis in bee population. This project is divided into several specific studies, of reaching the plant by either ground or aerial (drone) vehicle, a study of identification of the exact location, and ripeness of the flower, and a study of the actual pollen collection using advanced collectors.
- Autonomous landing of a Quad-Copter drone on a moving platform under GPS denied (indoor) conditions. The goal of this project is a hybrid system that can identify threats by the aerial component, and deal with them with the surface vehicle component.
- Autonomous Ground Vehicle which can serve as a smart stretcher. We developed an off-road vehicle that can serve as a stretcher for one or two injured persons, to move them from the battle zone without risking other soldiers. This can also serve as emergency equipment for evacuation after earthquakes etc. The vehicle has autonomous stabilizers so as not to exacerbate the injured person's situation while initial medical care is administered.
- Collaboration with Hyundai Motors and KAIST on the development of autonomous vehicle technologies, funded by Hyundai. An agreement was signed December 2017, and work on two projects is expected to start in Summer 2018.

At any given time we support about 20 different studies, in the areas of aerial, ground and marine vehicles, and autonomous subsystems. In addition to the Technion Donor funding, we are supported by grants from industry and government ministries in the amount of several million shekels. This is a good sign for the future sustainability of the program.

We have an outstanding graduate studies program, with about 50 current students, most of them full-time, including 14 Ph.D. students. By now 30 students of our Master's programs and 3 PhDs have graduated.



## Technion Integrated Cancer Center (TICC)

### Governance

TICC has established a scientific steering committee, which consists of world leaders in cancer research and treatment. The current membership includes Drs. Douglas Hannahan, Dafna Bar-Sagi, David Fisher, Keith Flaherty, and Technion members including Adam Schwartz, Uri Sivan, Noam Ziv, Yuval Shaked, Eyal Gottlieb, Aaron Ciechanover and Ze'ev Ronai. The first steering committee was held by SKYPE Video Conference on November 1st, in which principles pertaining to the integrated cancer center were discussed. Minutes from this meeting were distributed to leadership of the Faculty of Medicine and the Technion. TICC steering committee meetings are expected to take place annually.

### Charter

Following the TICC steering committee discussion, a charter document outlining the nature and future of the TICC was generated. The document, which provides a white paper for TICC operation and future function, is being reviewed by the Dean of the Faculty of Medicine and Technion leadership.

### Fundraising

During 2017 TICC and the Technion President together with the TICC co-director Prof Aaron Ciechanover were able to secure a donation of \$13M from the Azrieli Foundation, for the Azrieli Epigenetic Core in TICC. Fundraising to secure donation of >\$30M for the TICC building are advanced and expected to be completed during 2018. Overall, the goal of >\$120M will be part of the Technion leadership campaign in 2018/9.

### Workshops/ Conferences

TICC organized a one day workshop on precision medicine, that was held at the Rappaport Faculty of Medicine and the Rambam Health Care Campus on August 3rd 2017. Participants from all oncology units in Israel attended this workshop, which addressed novel means for future precision medicine initiatives.

As an outcome of this meeting it is planned to combine clinical initiatives in 3 hospitals (Rambam, Beilinson, Shaarei Zedek) that will launch the first large scale precision medicine based clinical trial.

The Second TICC cancer workshop took place on March 26, 2018. This one day cancer focus symposia featured international and national leaders to discuss the current state of knowledge in tumor cell heterogeneity and precision medicine. It is the first cancer workshop held in collaboration with WIS cancer center (MICC).

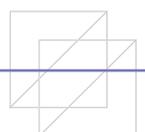
### Recruitment

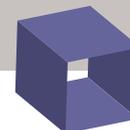
Dr. Na'ama Geva-Zatorsky from Harvard Medical School was recruited. Na'ama is an expert in computation and microbiota research and joined the faculty of medicine to establish the first microbiome based research group and mouse gnotobiotic facility.

Ongoing efforts are placed on the possible recruitment of an expert in system biology / computer sciences, who is using the computational tools to address critical questions in cancer biology and therapy.

### New and upgraded CORE Facilities

- TICC has completed the development of the PDX (Patient Derived Xenografts) room in the vivarium of the faculty of Medicine. This allows the implementation of patient tumor in avator mice which lack the immune system, thereby allowing to propagate the tumors for further assessments and drug screens. This room offers the first of it's kind PDX services at Technion. Initial experiments for members of the TICC have begun.
- TICC is supporting the establishment of the gnotobiotic room at the faculty of medicine, allowing to perform studies with mice who lack gut microbiota. This room will serve the newly recruited faculty member and establish the first core providing such services at the Technion. This room, with an overall cost of \$1M will be completed in the summer of 2018.
- TICC has completed a number of upgrades in the histopathology core at the faculty of medicine,





which included the purchase of new equipment for high throughput assessment and high level imaging.

- TICC supported the purchase of state of the art equipment for single cell analysis, which will be located at the faculty of medicine at Technion, part of matching funds with the Wolfson foundation support grant.
- The purchase of an advanced LC/MS system has been completed, with the support of TICC funds. This important upgrade to the proteomic facility at the Technion serves many of TICC faculty members.

## Collaborations

A number of collaborative initiatives were launched during 2017 and will be part of TICC activities in 2018. Those include:

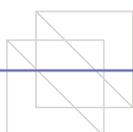
- TICC launched collaborative discussions across faculty and medical oncologists. These TICC FORUM meetings are held every 2 months at the medical school. The TICC FORUM meetings have over 30 participants (engineers, biologists and medical oncologists), who are provided with updates regarding the TICC operations, and two presentations by a basic scientist and clinicians. Often, representatives from the local biotech / pharma are also invited to present. Minutes are generated for these meetings and are distributed to all participants.
- TICC-Cancer Center at NYU Langone, funded by the Laura and Isaac Perlmutter initiative. So far, 3 calls and 7 grants were awarded. Grants are awarded to teams of 2 or more research groups who are collaborating to solve an unmet clinical need in cancer biology. In 2018 we expect to hold a third collaborative workshop where 10-15 of Technion faculty will discuss with their colleagues at NYU, ongoing and future collaborations.
- Rubinstein fellowship, to encourage multi-disciplinary collaborations within the TICC faculty. Out of 8 calls, 9 post-doctoral fellows and more recently also 2 graduate students, with background in different disciplines and who are from different faculties, were awarded. A ninth call for applicants will be released soon.
- New funding initiative for core based services was launched by TICC to promote and enable research in facilities that do not benefit from any other Technion support. Applications will be combined for philanthropy-based funding. Over 12 applications were submitted in response to the first RFA, which was announced in early 2017. Top applications for each of the the disciplines – gntobiotic / PDX / computational analyses – were funded by TICC funds, while the greater pool of applications has been modified to allow fundraising by the ATS.

## Training / Teaching

TICC has reached the stage enabling it to invest resources in advancing education\teaching of researchers (Technion-wide) and medical students\ professionals and reaching out to community in the field of cancer research and its application. TICC commitment to excellence in training is reflected in continued efforts to establish an integrated PhD program which will be launched in 2018. This program will be based on co-mentorship of TICC members, from complimentary disciplines in biology engineering and oncology. TICC will provide unique enhancements to assure the success of this program, which is expected to be the first cross-disciplinary based training, thriving for outstanding trainees and their future development as lead scientists.

## Clinical initiatives

- TICC interest in developing formal collaborations with the big HMOs in Israel was subject to delays, in part due to change of leadership at the biggest HMO, Clalit. Ongoing discussions with new leaders in Clalit aim at establishing a MOU, to promote the collaborative studies and personalized medicine initiatives. The agreement between Technion and these HMOs is expected to enable access for TICC members to the largest database of oncological patients in Israel.
- TICC enables a personalized medicine initiative with Rambam, the biggest oncology center in Northern Israel, and one of the Technion affiliated hospitals. As part of this initiative, TICC



will enable the use of software allowing protection of possible treatment modalities for cancer patients based on simple and relatively inexpensive biopsy-based analysis.

- Collaborative forums, where oncologists, engineers and scientists meet to discuss innovative solutions to existing problem were established as bi monthly meetings and annual workshops.

## **Samuel Neaman Institute for National Policy Research (SNI)**

The Samuel Neaman Institute for National Policy (SNI) serves as a think-tank platform for decision making at the national level in Israel. The Institute fulfills the vision of its founder, Samuel (Sam) Neaman, gathering experts in various fields that require informed decisions for discussion and analysis of issues on the public agenda and formulating recommendations for national policy. The researchers leading the studies conducted at the Institute are highly experienced experts in their fields and provide a broad overview of issues in the short and long-term that require decision-making and national guidance.

Research at the Samuel Neaman Institute is integrative, while exploiting effectively the freedom in choosing research topics and leveraging capabilities, multidimensional expertise, and the information databases accumulated over the years as a result of conducting hundreds of infrastructure studies. In addition, SNI initiates many seminars, expert workshops, and lectures to discuss the issues with which it deals, as well as building and operating many data centers.

The Samuel Neaman Institute covers a wide range of topics, including national policy research in the field of science and technology. Recently, the institute covered indicators for innovation in Israel and international comparisons, R&D output in Israel, innovation in different sectors, learning infrastructure, human resources training, and human capital development in various fields in Israel, the promotion of R&D and innovation in the periphery. Other topics covered include Israel's external relations in R&D at the national and institutional level, academic ties between Israel and the US, a look at the future of Israel's universities and their research status, and more

In the field of environmental protection, the researchers dealt with the issue of recording GHG emissions in Israel, global assessments of emissions from offshore drilling facilities, and the preparation of a basic calculation for collecting business waste fees.

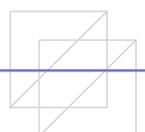
The Center for Industrial Excellence dealt with the issues of formulating a metropolitan plan for the north and a master plan for the establishment of an industrial park in Shfar'am. Other issues include innovative research on the possibility of exploiting insects for human benefit, formulating national policy for advanced production, investigating the success and failure factors of leading companies in Israel, and the integration of the Arab population in industry and the economy

In the field of energy, the Institute held several expert forums on topics such as: "Energy Efficiency in Israel", "Energy Security in Israel", and "Steps for Implementation after the Approval of the Gas Outline in Israel."

The Project "Ramzor North" continued to provide a computerized infrastructure for high-level mathematics teachers, an evaluation of the Technion's excellence program was conducted, and a report was compiled on models for a budget for international graduate students at the Technion.

The real estate policy in Israel and housing prices have also been addressed and the Institute's involvement on this subject is gaining momentum. The various studies and others will form an important foundation for formulating national policies on many issues in Israel, and that this will constitute the Samuel Neaman Institute's contribution to making informed choices at the national level. The list of all publications of the Institute in 2017 appears at <https://www.neaman.org.il/EN/Publications-From-2017>.

Prof. Omri Rand led the Neaman Institute very successfully for five years and in July 2017 he was replaced by Prof. Moshe Sidi.



## Technion Research and Development Foundation (TRDF)

TRDF comprises different divisions. The Research Authority (which handles Technion-sponsored research, research ties with the European Union, research with industry, and universities abroad); the Unit for Continuing Education and External Studies; the Israel Institute of Metals, and the Technion Technology Transfer (T<sup>3</sup>) Office which deals with the commercialization of intellectual property and patents, technological accelerators, and Ministry of Economics programs. These four TRDF departments are supported by the TRDF Human Resources office, a TRDF Financial Management office, and a TRDF In-House Legal Team.

### Financial Management

In accordance with the instructions from the Ministry of Finance and the Budget and Planning Committee, the balance sheets of the Technion and the TRDF are integrated. The projected profit for the period October 1, 2016 to September 30, 2017 is approximately NIS 76 million, not including the estimate for the actuarial maintenance of pensions. The financial balance of this period is influenced by the nearly NIS 32 million in pension payments to 377 retired workers. The continued improvement in the financial situation is a result of growth in income from intellectual properties.

The department of finance (including the payroll staff) and HR department relocated to the MALAT building to a temporary lodging (6<sup>th</sup> floor), while waiting for the renovation of the entrance floor for permanent housing. They joined T<sup>3</sup>, which moved to MALAT the previous year. The Research Authority will also get additional renovated space because of the increase in personnel.

### The Israel Institute of Metals

The role of the Institute of Metals is to promote local industry in the development of modern material systems. While in the past this focused on metals and alloys, modern materials engineering now includes, for example, corrosion and coatings, high performance ceramic systems, high thermal conductive materials, materials for the rising bio-medical Israeli market and functional metal based composites. As a result, the Institute of Metals is expanding its activities to the field of composites (Ceramic – Metals, Carbon-Metal, polymer-metals) with a strong interest in hybrid material production and interface technologies. The IIM has several activities within the framework of its laboratories such as corrosion, metallurgy, casting, surface treatments, vehicle engineering and qualification of steel. Most of the activities at the institute are conducted with active participation of industry. About 45 percent of the institute's income is derived from research funded by government offices, industry, the European Union and international industrial projects. Approximately 55 percent of the income comes from testing for industry. In 2017, the institute's turnover stood at approximately NIS 20 million NIS and the operational profit stood at 1 million NIS.

In order to play a pivotal role in materials development in Israel, the Metals Institute established a cutting-edge center for metal 3-D printing technologies. The center includes modern equipment in the field, including two Powder Bed metal printers (Electron Beam and Selective Laser Melting) and one Binder Jet ceramic printer (to be delivered in 2018), a high vacuum thermal treatment furnace, and advanced powder characterization equipment.

During 2017, the Metals Institute led several activities in the field of metal 3D printing (additive manufacturing), including a key role in the Israeli consortium for development and production of titanium aero-structures ("AATiD"), multilateral collaboration projects for improvement of metal 3D printing processes and national activities for implementation of advanced manufacturing processes in the Israeli industry. To facilitate the future uptake of the additive manufacturing technologies in the Bio-Med industry, the institute is promoting relevant training, equipment standardization and local market awareness.

## The Azrieli Division of Continuing Education and External Studies

The Azrieli Division of Continuing Education and External Studies specializes in organizing and developing advanced study programs, workshops and seminars for university graduates in various engineering and science domains. It also grants diplomas to high-ranking professionals in different fields of engineering, high-tech, architecture, medicine, administration and teaching through specially designed courses. All advanced courses and programs for a Master in Engineering (ME), a Master of Real Estate (MRE) or a Master of Urban Engineering (MUE) are carried out in collaboration with the relevant Technion faculties and interdisciplinary committees. The curriculums are kept up-to-date, according to developing trends in both the technology world and the organizational environment, maintaining the Technion's academic and practical leadership and excellence. Since January 2015, Prof. Zeev Gross serves as the Dean of the division.

The division's goals are to promote, update and enrich the knowledge of engineers, scientists, doctors, and other professionals in accordance with the needs of industry and trends of the marketplace. The division has an academic council that oversees the academic aspects of the division's activities, e.g. approval of all the programs and courses offered by the division and maintaining its high academic standards. The council, appointed by the Coordinating Committee of the Technion Senate, following a recommendation of the Senior Vice President, consists of professors from different faculties as well as office-holders such as the deans of undergraduate and graduate studies. Over the years the division has grown considerably, providing professionals with the opportunity to promote their education and careers.

The division operates out of three centers: the Technion campus in Haifa, the Technion-Azrieli Sarona Campus in Tel Aviv, and at the Azrieli College of Engineering in Jerusalem. This geographical distribution offers accessibility to a large population of Technion graduates and other professionals in different parts of the country. The Technion-Azrieli Sarona Campus in Tel Aviv was opened in July 2013 and teaching began soon after. The campus consists of three buildings in historic Sarona, a unique German Templar colony established in 1871. The Municipality of Tel Aviv has invested in restoring and developing the site in order to create a cultural and academic environment. After close to sixty years of operating in Tel Aviv in various ad-hoc locations, the division finally has a home and a real campus.

The response of Sarona campus' students is very positive and preliminary data indicates a substantial increase in prospective students for the summer and fall of 2017, and up through January 2018 more than 1,560 students in certificate programs have used the facilities in the campus.

The programs offered in the current academic year are:

### Programs leading to academic degrees:

- ME – Master in Engineering in:
  - \* Systems Engineering
  - \* Civil Engineering, with emphasis on development and business management in construction
- MRE – Master of Real Estate
- MUE - Master of Urban Engineering





An ME in Systems Engineering and Civil Engineering are offered in Tel Aviv and the programs in MRE, MUE, ME in System Engineering and are offered at the Haifa campus. 750 students are currently studying in the master's degree programs that are offered by the Azrieli Division of Continuing Education and External Studies. In upcoming years, we expect a decline in number of Master's degree students from our division to only 120 (due to recent MALAG directives).

### **Programs for Certification:**

The Azrieli Division of Continuing Education and External Studies offer a large variety of programs and single courses that do not result in a degree. These courses are typically intended for graduates of the Technion, or other universities, who are working in industry and wish to extend their knowledge in a certain area. The courses are divided into 7 main categories.

- Computers and Cyber
- Management and Innovation
- Real Estate
- Design and Architecture
- Medicine
- Coaching
- Photography

In addition to programs that are open to the general public, the division has taught tailored programs for various companies and organizations such as the Ministry of Defense, Ministry of Aliyah and Integration, Israel Railways, Rafael, HP and Israel Aircraft Industry.

About 3,700 students studied last year in more than 30 diploma courses in both the Haifa and the Tel Aviv campuses. On average we have about 1500 diploma students at any given time.

The Continuing Education School for Medical Doctors, in collaboration with the Faculty of Medicine, focuses on enhancing the medical knowledge, as well as expanding the intern and expert physician's knowledge on local and global innovations. The school offers 12 programs in areas such as gynecology, pain medicine, cardiology, and orthopedics. About 400 medical doctors study in these programs whose duration ranges from one semester to 3 years. In addition, the division offers a separate, long-running program in family medicine that is conducted at our center in Haifa and has 120 MD students.

### **Center for Cyber Studies:**

During 2017, we established a professional center for cyber security studies for university graduates and managers in the fields of IT and InfoSec. We also developed and promoted cyber related programs for excellent high-school students in collaboration with the Technion - Youth Center for Science and Technology. The youth courses provide a strong background and preparation for advance studies or military service.

All programs, developed with the aid and support of Technion's researchers and a variety of high-tech industries, offer cutting-edge training combined with a cyber-security training platform, fully customizable per users' level and needs. Since its establishment more than 100 students have graduated from the Cyber Security programs and we aim to expand the center and reach up to 150 more students until the end of 2018.

In addition to the programs for Israelis, we expanded our activity to India and other countries with tailor-made courses to meet the global growing demand for cyber experts.



### **International Collaboration:**

The Azrieli Continuing Education and External Studies Unit is developing programs in collaboration with leading academic institutions and industry worldwide, to provide professional services for students in Israel who want to obtain the leading tools in their field, and also to provide training for foreign professional delegations.

During 2017 the unit hosted a professional seminar in entrepreneurship and innovation for executives from China. Beginning from 2016, the unit conducts twice a year a unique negotiation workshop in collaboration with Harvard Law School.

In 2018, we will develop study programs focused on smart cities, urban planning and innovation for students and experts from international institutes through an innovative project called "Global City" in collaboration with the Municipality of Tel Aviv.

## **The Unit for Business Development and Commercialization of Intellectual Property**

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### **T<sup>3</sup> - Technion Technology Transfer Unit**

In the year 2016/17, T<sup>3</sup>, the Unit for business development continued promoting several initiatives that will hopefully contribute to turning the Technion into a hub of innovation, not only for Technion faculty and researchers, but also for Technion alumni.

### **AMIT – Alfred Mann Institute at the Technion**

2016/17 is marked as a year in which the transformation of AMIT into a hub of innovation that is supporting biomedical company formation by Technion students, faculty, and alumni was completed. In total, in 2016/17 8 AMIT's portfolio of companies has raised over 26 million dollars. AMIT has invested over 2.5 million dollar in these companies.

### **Patent Applications**

During 2016/17, 104 Technion researchers' invention disclosures were submitted. Of these, 88 were approved for registration. Unfortunately, 2016/17 also saw a decrease in applications in the field of life sciences (particularly medical equipment and new molecules); fields that traditionally provide a central source of commercial success for academic institutions in Israel and in the world. During 2017 the consolidation of Biorap into T<sup>3</sup> was completed, and we are hopeful that this will contribute in the near future to an increase of patent disclosures in these areas.

At the end of 2016/17 the Technion's patent portfolio included 698 active patent families of which 491 patent families are available for commercialization. We continue our efforts to quickly identify patents with the highest potential for commercialization in order to maximize the exploitation of our limited resources.

### **Licensing Agreements**

In 2016/17, T<sup>3</sup> signed 90 commercialization and investment agreements (including those originating from the Technion accelerator (the DRIVE and AMIT)). Of these 15 MOUs were signed in various fields including: cultured meat; Al-air batteries; barcode diagnostics; human biometric identification; selective separation of magnesium ions from sea water, real time physiological bio markers and others.

Seven license agreements were signed with new companies in different fields, including: textured cultured meat, aluminum-air (Al-air) battery technology, platform technology for single cell analysis for cancer tumor cells, real time physiological bio markers, flexible sensing patch solutions, diagnostic robotics and personalized cancer medicine

In addition six license and sublicense agreements were signed with companies licensing technologies in the fields of medical analysis, medical diagnosis, pain relief treatment for osteoarthritis and immunotherapy.





A 7 million dollar joint venture (Juangsu Sunshine Medical Devices, Co., Ltd), between TRDF and Jaingsu Sunshine Group, Longshang Holdings was signed to engage in the development, production, manufacturing, sales and marketing of kits for exhaled breath in the field of lung and gastric cancer diagnostics.

Eight “Magnetron” agreements were signed with leading companies in Israel, including: Elbit, Shekel, Kemada, Elisra and Liveperson. Six “Nofar” agreements were signed with companies including Frutarom and Given- Imaging.

### **Income from Commercialization**

In the past year, TRDF’s income from commercialization and/or the monetization of the Technion’s intellectual property rights by other means amounted to ~30 million USD (including the researchers’ share). It is important to note that this does not include income arising following the enforcement of Technion IP rights via legal or semi legal procedures, income from research agreements resulting from commercialization agreements, income arising from patent expenses reimbursement, and more. In 2016/17, income from these sources totaled over 1 million USD.

### **Proof-of-Concept Grants**

A total of 50,000 USD were invested from the Uzi and Michal Halevy Fund (2 projects). A total of 101,000 USD were invested from the Polak Fund (3 projects). Three proof of concept grants were also awarded from the Spira Fund. These proof of concept grants were provided mostly via the Technion, but T<sup>3</sup> coordinates the review and analysis of proposals. As in previous years, this year the importance of the “Kamin” Fund, which functions under the R&D regulations and is administered by the Israel Innovation Authority, was notable. Kamin supports extended proof of concept research with the specific end-goal of technology transfer. During 2016/17, the approved budget of supported Technion projects by the “Kamin” Fund (new and continuing projects) exceeded \$2.4M, a fact that well demonstrates the importance of the fund as well as the commercialization potential of technologies developed by Technion researchers.

### **Fundraising by Technion Companies**

During the past year, Technion related companies (i.e. companies based on Technion IP or in which TRDF holds equity and / or royalty rights) raised ~120 million USD. Among the companies which raised considerable amounts are: Nutrinia (developing pharmaceuticals to treat rare conditions of the gastrointestinal tract), Eloxx (discovery, development and commercialization of compounds for the treatment of genetic diseases caused by nonsense mutations), Perflow Medical (Neurovascular treatments), Colospan (anastomosis protection device for colorectal surgery), MEmic (surgical robotics) and Eximo Medical (hybrid catheters for interventional procedures).

As in previous years, this year TRDF made efforts to protect its share in the various companies by participating in follow-on investment rounds and maintain its pro-rata share (in full or in part). The full amount invested by the TRDF within this framework in affiliated companies totaled more than 50,000 USD. Additionally, the Technion Investment Opportunities Fund (TIOF), whose function is to invest in Technion-related companies in order to preserve the scope of Technion’s holdings, invested over 700,000 USD in 4 companies: Eloxx (discovery, development and commercialization of compounds for the treatment of genetic diseases caused by nonsense mutations), Nutrinia (neonatal gastrointestinal treatment); ARTsys360 (radar antenna) and WellToDo (catalytic denitrification of potable water).

### **Technion Accelerator**

At the end of 2016 the Technion Drive Accelerator was established. The fields of innovation supported by the Drive include Digital Health, Materials, ICT, Robotics, Augmented Reality, Big Data, FinTech and Autonomous Vehicles.

During 2017, 15 new companies were accepted into the DRIVE, a total of \$540,000 investments in 12 startups established by Technion faculty and/or alumni, was approved. Among the DRIVE portfolio companies are Mobility Insight (which is well on its way to raising \$5 million for its vehicle fleet and transportation management solution). In the area of autonomous systems, two companies addressing the challenges of drone technology joined the Drive: Convexum, which offers a cybersecurity



platform for taking over and landing malicious drones; and RegulusX Cyber which offers an off-the-shelf security suite to protect drones from cyber-attacks and other system breaches. Another company, Feelit, is bringing the sense of touch to robotics with flexible sensing patch solutions that aim to exceed the sensitivity of human touch. Some of the other achievements during the 1<sup>st</sup> year of operation of the DRIVE Accelerator include:

- Over 125 startups and investment opportunities were reviewed by the DRIVE Investment Team.
- 15 companies were accepted into the DRIVE with a DRIVE investment totaling \$540K.
- 8 startups entered into collaboration agreements with leading corporations such as Enel, Strauss, K2 Unmanned Systems.
- 7 startups were successful in closing a 1st round of investment from reputable and well recognized ventures such as Canaan Partners, F2 Capital, Sierra Ventures, 500 startups, etc.
- 7 startups completed successful pilots.
- 8 startups expanded their teams.
- 3 startups are collaborating with public authorities, municipalities etc.
- More than 75 experts were included as mentors who are dedicated to helping the teams set priorities, execute based on their vision and strategy, and achieve their milestones.
- The Drive academy hosted more than 60 workshops and seminars with more than 70 speakers.
- The Drive organized more than 16 meetings between the teams and top global brands such as BNP Paribas, Walmart, Total, Bayer, Orange etc.
- \$210,000 was raised from sponsors which include WeHealth by Servier; L'Oreal; LH Financial; FineTech Pharmaceutical; Global IoT Technology Ventures, Inc. (GiTV); FengHe Group; Cybele holdings; Liberty Mutual Insurance; Goodwin and Schlumberger.

## Faculty Research Achievements

### Topological Insulator Lasers

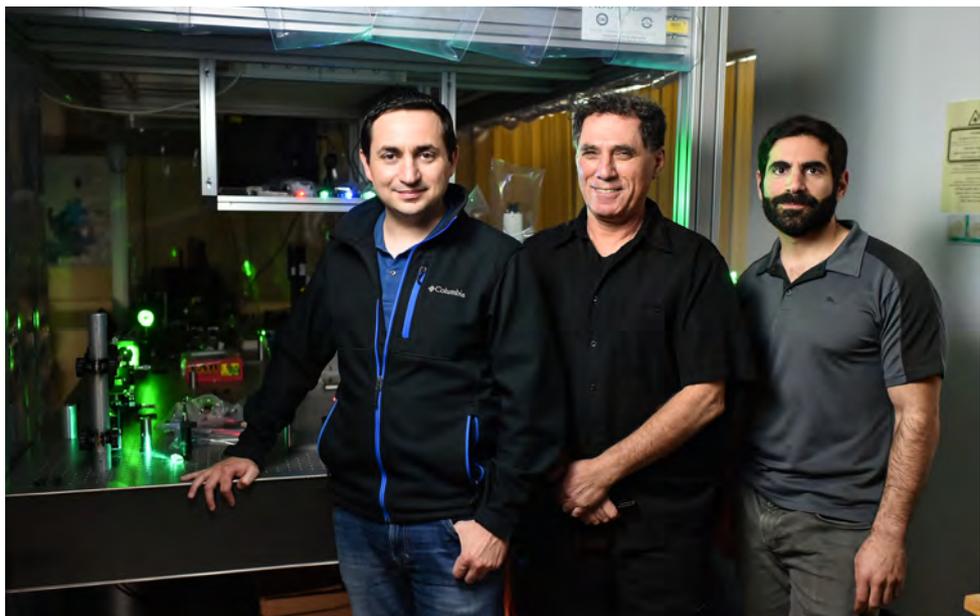
Israeli and US researchers have developed a new highly efficient coherent and robust semiconductor laser system: the topological insulator laser.

The research, published in the prestigious journal *Science*, was conducted by Physics Prof. Moti Segev and his team: Dr. Miguel A. Bandres and Gal Harari; in collaboration with scientists from the US and Singapore.

Topological insulators are one of the most innovative and promising areas of physics in recent years, providing new insight into the basic understanding of protected transport. Several years ago, the same group from Technion introduced these ideas in photonics, and demonstrated a Photonic Topological Insulator.

Now, the researchers found a way to use the properties of photonic topological insulators to build a new type of laser which shows a unique fundamental behavior and greatly improves the robustness and the performance of laser arrays, opening the door for a vast number of future applications.

“This new laser system went against all common knowledge about topological insulators” said Prof. Segev “



Group photo (L-R): Dr. Miguel A. Bandres, Prof. Moti Segev and Gal Harari

The researchers demonstrated that not only are topological insulator lasers theoretically possible and experimentally feasible but that integrating these properties create more highly efficient lasers. As such, the results of the study pave the way towards a novel class of active topological photonic devices that may be integrated with sensors, antennas and other photonic devices.

## What Do Your Eyes Say?

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Researchers at the Viterbi Faculty of Electrical Engineering have developed a device that can diagnose diseases by means of an eyelid motion monitor (EMM). The project was published in and was ranked in the top 20 in the Texas Instruments Innovation Challenge (TIIC) – Europe Design Contest.

The device was first developed by Prof. Levi Schachter and doctoral student Adi Hanuka, who began working on it as an undergraduate. Hanuka continued working on it during her graduate studies, with the help of a team of students.

Over the past two years, the device has been used in clinical trials at Haemek Medical Center in Afula, Israel “Eyelid motion provides us with meaningful information about the health of a patient,” explained Hanuka. “This motion can indicate not only eye diseases, but also neurological diseases such as Parkinson’s, and autoimmune diseases such as Grave’s.”

Glasses are fitted with a hardware and software system that monitors and interprets eyelid movements.

## De-Jargonizing Program Helps Decode Science Speak

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Science is fascinating, but sentences that are full of expert-level terms and descriptions can scare away many people. Can scientists learn to talk about their research without using too many technical terms?

To help scientists recognize which words are jargon and should be avoided or explained when engaging with the public, researchers at the Technion-Israel Institute of Technology and HIT-Holon Institute of Technology have created a program that automatically identifies terms the average person may not know.

The De-Jargonizer was introduced in a recent paper published in the journal *PLoS One*. The program is free of charge and scientist-friendly. Once a text is uploaded or pasted, the algorithm identifies words in the text as general vocabulary or jargon. This is based on frequency of the words on an internet news site, designed and written for the public. The corpus will be updated periodically, and can be expanded to include other sources and languages.

“The De-Jargonizer provides a grim glimpse at the current level of jargon in scientific writing,” says Technion Prof. Ayelet Baram-Tsabari who led the research with Dr. Tzipora Rakedzon.

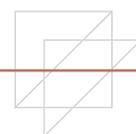
## New Microfluidic Chip

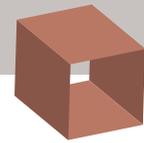
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Proteins are one of the most important classes of biomarkers. Protein detection is critical in a wide variety of tests that include the diagnosis of malaria, detection of a cardiovascular event, cancer screening, monitoring, and more.

A Technion team headed by Mechanical Engineering Assistant Prof. Moran Bercovici and an IBM Research team in Zurich has improved the sensitivity of protein detection in immunoassays by more than 1,000-fold, when compared to standard immunoassay implementation. The team’s method – which appears on the cover of the peer-reviewed journal *Analytical Chemistry* – is based on a simple piece of hardware: a microfluidic chip containing flow channels the width of a human hair.

Bercovici explains, “We use an old focusing technique called isotachopheresis (ITP) in a new way. Using a combination of electric fields and specialized chemistry, we collect proteins into a tiny





volume and precisely deliver them to react with detection antibodies patterned on the surface of the microchannel.”

High sensitivity in detection is particularly important when protein biomarkers are present in extremely small numbers, as is the case in the early stages of a disease. The team’s approach might one day enable simple devices capable of analyzing small samples (such as a drop of blood), replacing the large and sophisticated laboratory equipment that is currently required.

## See the Night in a New Light

Researchers from Technion and the University of Toronto have developed a technology for producing a new understanding of the nighttime landscape—based on the flicker of electric lights.

Artificial lighting is produced by a variety of lamps that are found in streetlights, offices, searchlights, billboards, computer monitors and more. Light emitted from all lamps connected to the electricity grid is constantly changing, but because of the high speed of this effect, people do not sense this flickering.

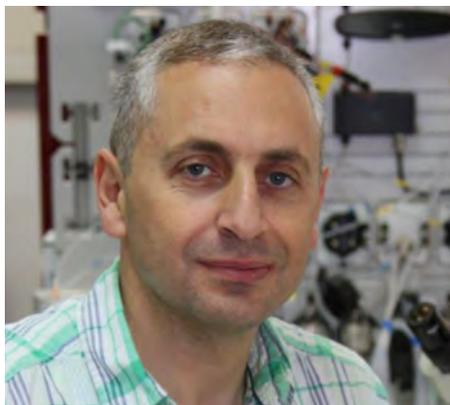
Lead researcher Mark Sheinin of the Viterbi Faculty of Electrical Engineering, Technion Prof. Yoav Schechner and Prof. Kyros Kutulakos of the University of Toronto presented a new way to derive a great deal of useful data from the flicker patterns of lighted scenes at the Computer Vision and Pattern Recognition conference of the Institute of Electrical and Electronics Engineers (IEEE),

The researchers developed a system that extracts information from a passive video (without additional lighting) of the desired scene. The analysis of the information concludes how the scene would look if some of the bulbs were turned off, amplified or replaced with a different type of light. The technology has developed a pathway for further research including the controlled illumination of objects, the measurement of three-dimensional objects and their surface texture based on their shadow, and the remote analysis of the properties of the electrical grid by optical methods.

The researchers found that the flicker across city scale provides valuable information about the electric grid itself. Based on this industrial application, they submitted a patent jointly with Technion Prof. Yoash Levron.

## Cats and Development of Anti-HIV Drugs

Feline AIDS is caused by the Feline Immunodeficiency Virus (FIV), which is very similar to the HIV-1 virus. FIV does not infect humans, but many groups research the virus because of its numerous parallels with the AIDS virus.



Prof. Akram Alian (L) and Dr. Meytal Galilee (R)



The power of the AIDS virus lies in the variability of its genome, which is driven by reverse transcriptase, one of the proteins it produces. Reverse transcriptase “copies” the viral RNA genome into DNA, which is the opposite molecule that typically occurs in nature. FIV and HIV-1 viruses, like other retroviruses, “implant” this DNA into the host genome, forcing the host cells to generate new copies of the virus. The reverse transcriptase protein is a central target for new anti-AIDS drugs. Although FIV and HIV are highly similar, the FIV protein is resistant to drugs which can inhibit the same protein in HIV-1, a finding which has puzzled scientists until now.

Now, for the first time, Assistant Prof. Akram Alian and Dr. Meytal Galilee from the Faculty of Biology have shown the 3D structure of this protein in the FIV, and used it to uncover the mechanistic basis of viral resistance to anti-reverse transcriptase drugs. Their findings, published recently in *PLOS Pathogens*, show that the FIV protein forms a closed pocket that blocks the drugs from effective binding.

Alian said, “We hope that our discoveries will pave the way toward the development of drugs that will ‘break into’ this pocket, thereby enabling the drugs to inhibit FIV from multiplying. Due to the parallels between FIV and HIV, we assume that the discovery will also assist in combatting AIDS”.

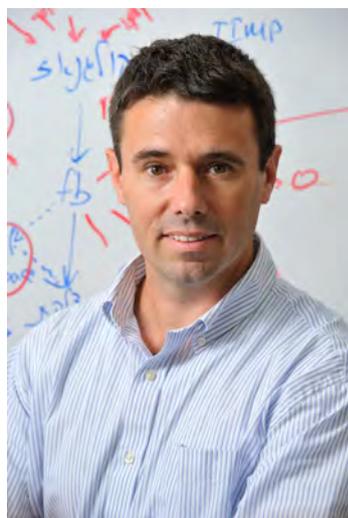
## Nanoparticles Deliver Drugs on Target

The random dispersion of drugs throughout the body often lowers their effectiveness and damages healthy tissue. A prime example of this is the use of chemotherapy drugs. This has led to a global effort to develop smarter drug delivery systems that will more effectively target the specific part of the body affected by cancer, bypassing healthy tissue.

A recent issue of *ACS Applied Materials & Interfaces* presents groundbreaking work in the field by Biotechnology and Food Engineering doctoral candidate Alona Shagan and Assistant Prof. Boaz Mizrahi. They have developed a technology that enables drugs to be delivered and released only to the diseased tissue. The new method uses a unique polymer coating that contains nanoscale gold particles. The drug only releases when a light shines on the gold particles, causing the polymeric coating to melt.

The researchers designed the one-of-a-kind delivery method to release under longwave light (Near-Infrared, NIR). The light warms the gold nanoshells, melting the polymer packaging, and releasing the drug. The primary advantage of NIR light is its ability to penetrate bodily tissues without harming them.

“We’ve developed a material with varying melting points, allowing us to control it using low intensities,” explains Prof. Mizrahi. “Our system is composed of FDA-approved materials, and we are relatively close to clinical application.”

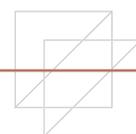


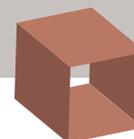
Prof. Avi Schroeder

## Orthodontic Surgery No Incision Necessary

Technion researchers have developed a technology that replaces scalpels with natural biological materials, an “enzymatic blade.” The study was led by Dr. Assaf Zinger, within the framework of his doctoral research, mentored by Assistant Professor Avi Schroeder, the director of the Laboratory of Targeted Drug Delivery and Personalized Medicine at the Wolfson Faculty of Chemical Engineering.

The research was published recently in *ACS Nano*. The application spares the pain associated with orthodontic surgeries and significantly reduces tissue recovery time. The novel technology is based on rational use of enzymes – biological molecules the body uses to repair itself, as well as on use of nanoparticles for achieving a targeted therapeutic profile.





To speed up orthodontic treatment, which typically lasts about two years, many people undergo invasive surgery, in which collagen fibers that connect the tooth to the underlying bone tissue are cut.

The new Technion technology softens the collagen fibers via the targeted release of collagenase – an enzyme that specifically breaks down collagen. Using techniques developed in Schroeder's lab, the collagenase is packaged into liposomes – nanometric vesicles. With this special nanotechnology, an ointment is applied on the target site, so that the enzyme begins to gradually leak from the liposome and soften the collagen fibers.

## The Golden Gate to Iron

Iron is an essential component of life. It is responsible for transporting oxygen in red blood cells, for activation of enzymes involved in DNA production and for energy production in the cell. Iron deficiency or overload may lead to stress, which mediates inflammatory diseases, cancer and neurodegenerative diseases, such as Alzheimer's and Parkinson's disease.

A cover story of the *Blood Journal* presents research conducted in the Faculty of Biotechnology and Food Engineering that uncovers, for the first time, a mechanism for cellular transport and secretion of ferritin, a protein that was considered central mainly to iron storage in the human body. Led by Dr. Marianna Truman-Rosentsvit and Assistant Prof. Esther Meyron-Holtz, the benchmark study significantly advances our understanding of the way the body handles iron, opening new horizons for research and therapeutics.

The findings of this study move ferritin to the center stage of systemic iron metabolism, as a protein that not only stores, but also transports iron in a controlled manner, giving it all attributes of an iron regulator.

## Photosynthesis-Inspired Hydrogen Fuel Production

Research groups from around the world have been addressing the challenge of splitting water in order to produce hydrogen. Hydrogen fuel is a 'green' and ecological alternative for existing fuels, produced water.

In an article published in *Nature Catalysis*, Assistant Prof. Galia Maayan of the Schulich Faculty of Chemistry presents a molecular complex (also called an artificial molecular cluster) that dramatically improves the efficiency of water oxidation. It does so by biomimicry. In this specific case, the inspiration comes from the process of photosynthesis in nature.

Manganese (Mn), is one of the essential elements in the photosynthesis process. Much research was conducted in order to enable the utilization of manganese as a catalyst for water splitting, in



Naama Gluz (L) and Prof. Galia Maayan (R)



combination with electricity as an energy source, aiming to produce hydrogen – a process known as water electrolysis.

This is a very challenging process, often requiring a large amount of energy to set it in motion. Moreover, Mn-based catalysts are often unstable and decompose rapidly during this process. The molecular complex developed by Maayan is expected to change this situation.

Much of the work described in the article was carried out by the student Naama Gluz as part of her MSc studies under the supervision of Maayan.

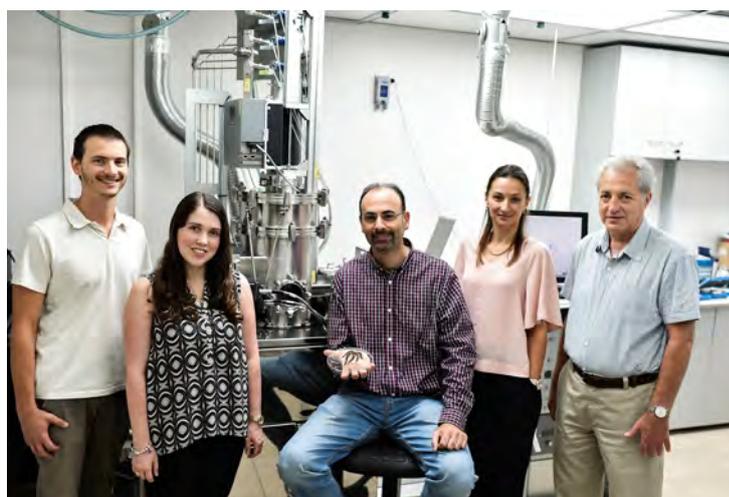
## From Starfish to Ceramics

An international research team led by Materials Science and Engineering Prof. Boaz Pokroy have discovered the process of creating “tempered-like optical lenses” underwater. They’ve discovered how a brittle starfish can create material similar to tempered glass underwater at ambient conditions. The findings, published in *Science*, may open new bio-inspired routes for toughening brittle ceramics in various applications.

The researchers uncovered the unique protective mechanism of highly resistant lenses located on the arms of *Ophiocoma wendtii*, a coral reef-dwelling brittle starfish. Made of chalk, the lenses are powerful and accurate, and the deciphering of their crystalline and nanoscale structure has occupied lead researcher Prof. Boaz Pokroy and his team for the past three years.

Prof. Pokroy researches materials created by living organisms, and produces analogous synthetic materials using methods inspired by nature.

The formation of calcite lenses was discovered thanks to a long series of experiments at various



facilities including the ESRF synchrotron in Grenoble, France and with the Titan microscope at Technion. The study was conducted with the support of Technion’s Russell Berrie Nanotechnology Institute, the Alon Fellowship, and the European Research Council.

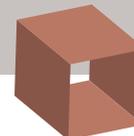
Left to right: Stas Kozachevich, Yael Etinger-Geller, Prof. Boaz Pokroy, Dr. Iryna Polishchuk and Dr. Alex Katsman

## Marine Sponges and Glass Technology

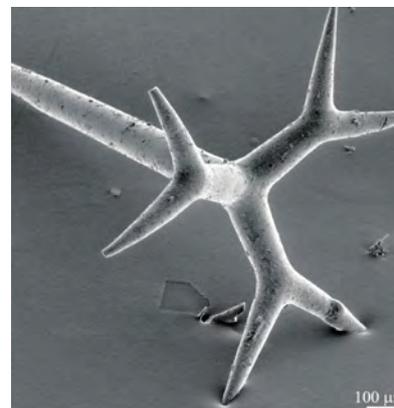
A paper published in *Science Advances* by Materials Science and Engineering Prof. Emil Zolotoyabko, and colleagues in Germany is helping to unravel that mystery. Using the most advanced X-ray methods, nano-tomography and focused X-ray diffraction, available at the European Synchrotron Radiation Facility (ESRF, Grenoble, France), the group uncovered the principles of spicule morphogenesis in certain kinds of marine sponges.

“By using the crystalline axial filament, nature has mastered the fabrication of extremely complex glass structures at low temperatures that is far beyond the abilities of current human technology,”





says Prof. Zolotoyabko. “Further understanding of how the organisms regulate the branching events in the filaments has the potential to be adopted in the production of technologically relevant nano-crystalline materials of complicated shapes for nano-electronics. Mimicking natural recipes in the lab will allow us to develop novel glass technology working at room temperature.”



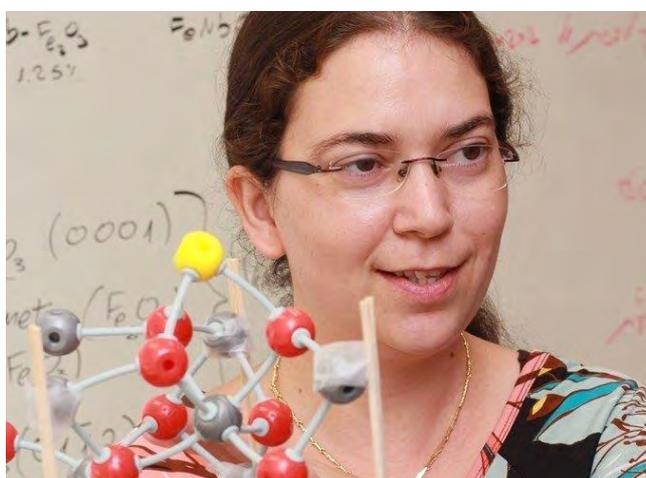
Prof. Emil Zolotoyabko

## Secret to Success

The research group led by Materials Science and Engineering Asst. Prof. Maytal Caspary Toroker deciphered the reason for the success of doping iron for the best catalyst known today for splitting water. The article published in *Physical Chemistry Chemical Physics*, reveals for the first time why iron is successful for expedited effective oxidation of water. A deeper understanding of the mechanism of splitting water is expected to lead to the development of additional catalysts that can oxidize water and store energy.

Asst. Prof. Toroker’s group is engaged in theoretical-computational methods for characterizing properties of materials and for finding a correlation between the structure and material functionality.

Recently, a particularly good material was found that can speed up the process of water oxidation – a substance called nickel oxyhydroxide, NiOOH, when this material is contaminated / doped with iron then the efficiency is greatly enhanced.



Prof. Maytal Caspary Toroker



Since the discovery, many groups around the world have been using this catalyst for the purpose of splitting water, but the mechanism by which iron is effective has never been explained. Toroker's group has published 12 articles and a good number of the articles involve characterization of the catalyst NiOOH. The research is supported by the Nancy and Stephen Grand Technion Energy Program (GTEP).

## Sting of the Jellyfish

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Researchers at Technion and the University of Haifa are deciphering the stinging mechanism of the jellyfish. The most common jellyfish in Israel is the nomad.

A study conducted at Technion and published in the Journal of the Royal Society Interface is the first to explain the unique stinging mechanism of the nomad jellyfish. According to Civil and Environmental Engineering Prof. Uri Shavit, "The jellyfish attacks its prey by injecting a toxic substance by means of thousands of microscopic syringes located on each of its tentacles. The syringe is located inside the stinging cell (nematocyte) and is packaged inside a spherical capsule. In response to chemical changes in the environment or physical contact, pressure increases inside the capsule and the needle is ejected at a tremendous acceleration, one hundred times the acceleration of a rifle bullet."

The study, based on measurements taken using lab-on-chip technology and the development of a mathematical model that tracks the movement of the substance within the system, found that the driving force is not limited to the capsule alone. It is a powerful osmotic mechanism that develops at the needle's moving front.

The elongation mechanism of the stinging needles was deciphered by Prof. Shavit and Mechanical Engineering Prof. Gilad Yossifon and Dr. Tamar Lotan of the University of Haifa.

## Administration and Finance

### Israel's Economy in 2017

Israel's economic growth again outpaced that in most of the developed nations in 2017, despite global challenges. For the year, GDP grew by just over 3 per cent, but accelerated in the second half of the year to an annual rate of 3.7 per cent. The main growth engine was personal consumption, which rose by 5.2 per cent during the second half of 2017, offset by a large increase in imports (12.3 per cent rise).

Part of the import boom was due to the strong shekel, which made imports cheaper. The shekel strengthened from 3.67 shekels per dollar in January 2017 to only 3.38 shekels per dollar in January 2018, despite large Bank of Israel dollar purchases. Israel's foreign exchange holdings rose by over 16 per cent, from \$101 b. in January 2017 to \$117.6 billion in January 2018.

Despite the strong shekel, exports grew by 8 percent in 2017, driven mainly by high-tech exports and strong tourism. Over 3.2 million tourists came to Israel in 2017, an increase of 22 per cent.

Israel's trade deficit (imports minus exports) widened from \$12.9 billion in 2016 to \$15 b. in 2017.

The unemployment rate continued to fall, reaching an all-time historical low of 3.7 per cent in January 2018, nearly half the average unemployment rate during 1992-2018.

The Tel Aviv Stock Exchange TASE 125 index rose by 10 % during 2017, then declined somewhat. Israeli stock prices were buoyed by the strong US stock markets, which saw the Dow Jones Index rise by 25 per cent, the S&P by 19 per cent, and NADAQ, by 28 per cent, in 2017.

The number of olim (new immigrants) in 2017 remained at 26,000, the same as in 2016. Some three-fourths of the olim came from Europe, and of those, three-quarters came from former USSR countries, many of them from troubled Ukraine.

The strong credit expansion continued. The money supply grew by 11.5 % in 2017. The strong growth in credit and low interest rates have not fueled inflation, partly because the rate at which money changes hands ("velocity of money") has slowed.

Israel's fiscal stability continued to improve. The Finance Ministry announced that for the first time since the early years of the State of Israel, government debt fell below 60% of Gross Domestic Product, at the end of 2017. This contrasts sharply with a ratio of some 300% during 1978-84, and 130% between 1990 and 1998.

Housing remains expensive. It takes 13 years of the existing average wage to buy an average apartment; the comparable figure for Germany is 7 years. Housing prices have fallen a bit lately, by 1.4 per cent between last September and December, but remain very high. The basic problem is supply. In 2017, housing starts were less than 50,000, compared with about 54,000 in 2015 and 2016.

Bank of Israel macroeconomists forecast that in 2018, GDP growth will be 3.4 per cent, and 3.5 per cent in 2019. They expect unemployment to decline slightly, to 3.6 per cent. In 2017, the Consumer Price Index rose by only 0.3 per cent, but is forecasted to rise by 1.1 per cent in 2018 and 1.4 per cent in 2019. The higher inflation will be driven in part by the tight labor market and rising wages.

This year Israel celebrates its 70th anniversary. It is a good time to salute Israel's economic miracle driven by the remarkable higher education system that in turn drives Israel's innovative high-tech sector.

For the current academic year, there are 309,000 students in higher education, a third of whom are enrolled in research universities. Almost one-half of all those aged 20-24 undertake college degrees. Some 60 per cent of all students are women, and one in six are Arab.

When the State of Israel was founded in 1948, it was a very poor country, with GDP per capita of approximately \$1,500. By 2007, strong economic growth drove per capita GDP to \$22,500, and today, to over \$38,000. According to the World Competitiveness Yearbook, Israel is ranked #1 in the world, for instance, in a key indicator, digital technological skills.

There is, however, a dark side. According to Prof. Manuel Trajtenberg, until September a Knesset Member and now senior research fellow at the S. Neaman Institute, Israel's strong economy is not matched by strong social policy. In "social cohesion", Israel ranks only 32nd (out of 63 globally competitive nations), and its distribution of income is less equal than all but three developed nations (US, Turkey, Mexico). Widespread poverty exists, especially among the elderly. Trajtenberg is now engaged in research to find ways to remedy the paradox of "strong economy, weak society".

This report was prepared by Prof. (emer.) Shlomo Maital, senior research fellow at the S. Neaman Institute for National Policy Research, Technion.

## Budget and Finance

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### Operating Budget

The operating budget covers all of the Technion's operational activities, including salaries and pension payments, student's fellowships and scholarships, faculty recruitment, maintenance and other expenses. About seventy percent of budgeted expenses are designated for staff emoluments and pension payments. On the other hand, about the same percentage of this budget covered by the government's allocation. The support of the government is transferred to the Technion, as to all others Israeli universities, via the P&BC, the Planning and Budgeting Committee of the Council for Higher Education.

The main challenges and emphases for the upcoming years are recruitment and absorption of new faculty members, upgrading the quality of teaching and upgrading of physical facilities.

The Technion managed to recruit about 145 new faculty members over the last five years around 29 faculty each year. Last year, the Technion's student body numbered around 14,600 (undergraduates and graduates) and 396 postdoctoral fellows, with continuing tendency of increasing the number of graduate students and post-doc fellows. The increased senior academic positions and new faculty recruitment will reflect on the students per faculty ratio and results an enhanced academic quality and strength. During the last ten years, the technical and administrative staff was reduced by about 5%. The main goal is to reduce low-level administrative positions and replace them by high skills technical positions.

### 2016/2017 Budget Year

The 2016/2017 budget year ended with a deficit of NIS 29.9 million, slightly lower than budgeted. The deficit was covered by withdrawals from Technion's reserves.

### The 2017/2018 Budget Year

The 2017/2018 budget framework is NIS 1,510 million. It includes an increase of NIS 46 million (in 2017/2018 prices) for expansion of academic and other activities and a NIS 26 million deficit (about 1.7% of the budget framework). The table below shows the budget summary (in NIS million):



Salaries	761	50%
Pensions	288	19%
Student fellowships, scholarships, etc.	114	8%
Maintenance	121	8%
Others	226	15%
<b>Total Expenses</b>	<b>1,510</b>	<b>100%</b>

P&BC	1,067	72%
Tuition	126	8%
Societies	69	5%
Self-income	222	15%
<b>Total Income</b>	<b>1,484</b>	<b>100%</b>

The deficit will be covered by withdrawals from Technion's reserves.

## Development Projects

Development projects are managed by multi-year budgets and schedules. In the year 2016/2017, the Technion invested (cash and obligations) NIS 148 million (\$40 million) in development projects. Resources for development projects amounted to NIS 202 million (\$55 million). The Technion policy is to approve new construction of buildings and large renovation projects only according to the income received or guaranteed for each project. Total investment in development projects in the last 10 years was NIS 1,696 million.

The table below lists our investments (in NIS millions) in development projects, divided into three major categories:

Category	Invested in Projects
	2016/2017
Buildings, renovations, infrastructure	94
Multidisciplinary research centers	22
Equipment and Laboratories (not including laboratories establishment for new faculty members)	32
<b>Total (NIS million)</b>	<b>148</b>

## Investments

Technion's investment portfolio includes the Technion Pension Reserve Fund, Restricted Net Assets designated for scholarships, research, chairs, projects and others, Unrestricted Net Assets designated for research, development and others. The funds are invested by an investment pool method. The investment policy is set and reviewed periodically by a public committee. The value of the portfolio on September 30, 2017 was NIS 6,448.3 million (\$1,827.2 million). About 47% of the portfolio was in Israeli index-linked investments, 8% in foreign-exchange linked investments, 29% in shares, and 16% in liquid assets.



## Pension Payments and Actuarial Liability

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Pension payments to most of the Technion retirees are provided from the operating budget. In 2016/2017, pension payments were NIS 277 million, representing 19% of the operating budget; this year, they are expected to reach a total of NIS 288 million. This percentage is expected to remain unchanged over the coming years, after which it will slowly decline and eventually level out. As was pointed out in previous reports, as of January 1, 2004, all new Technion employees, both faculty and administrative staff, have a regular external pension fund. This will have a very positive, long-term effect on Technion's financial stability. The total actuarial liability of the Technion as of September 30, 2017 is NIS 6.0 billion (Including the TRDF – 6.5 billion). In accordance with new directives of the Israel Accounting Standards Board, the Financial Statements will include, for the first time, a liability in respect of about 50% of the actuarial liability. The amount of the liability recorded in the Financial Statement represents the total amount of the liability less the government participation on a yearly basis.



## Physical Development

The Technion is facing a massive new wave of construction, while taking into account the ongoing pace of study and research and minimizing disturbances. New Faculty buildings – mainly for research purposes, new dormitories – on campus as well as within the City of Haifa, and additional facilities for student welfare are being promoted for construction.

Giving priority to Technion's goal to enroll the best researchers, a new department within the Construction and Maintenance Division was established. Its goal is to improve the recruitment process of new faculty and shorten construction schedules. In the past year, over 60 laboratories were in the process of being established.

### The main targets for 2018 are:

- **Completion of Technion's new main gates** – Wilstein Gate (Neve Sha'anana) and Mertens Gate (Nesher)
- **Occupancy of:** the Polak Visitors Center and the 8<sup>th</sup> floor of the Ullmann Teaching Center
- **Completion of the statutory process and promotion of the detailed planning of the following:**
  1. Electrical Engineering Research Building
  2. Sagol Center for Intelligent Composite Materials
  3. Goldenberg Architecture Studio Pavilion
  4. Zielony Student Union Building – 4<sup>th</sup> floor expansion
- **Promotion of the preliminary design of the following new buildings:**
  1. New research building – Faculty of Aerospace Engineering.
  2. New research building – Life Sciences Laboratories.
  3. Technion Integrated Cancer Center Research Wing near the Rappaport Faculty of Medicine.
- **Continuing provision of dormitories:**
  1. Tender for the Broshim Dormitory Towers on campus.
  2. Statutory approval for medical students' dormitories in the city of Haifa.
  3. Statutory approval for creating dormitories within Technion's Hadar neighborhood site.
- **Infrastructure replacements and improvements** – mainly heavy energy-consuming systems.

**The Master Plan** identified four potential areas for accommodating 70% of future development for mixed use by academia, for innovation, welfare and housing. The design of these areas is necessary in order to enlarge academic activity on campus.

The conservation policy of the Strategic Master Plan includes 10 buildings on the Technion Campus Heritage List. This list was approved by relevant municipal authorities. Renovating the buildings is

being carried out according to the conservation policy.

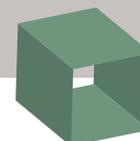
**The Cable Car project**, being carried out by the “Yaffe Nof” municipal company, will connect the Technion and the University of Haifa with Haifa’s northern transportation hub (Merkazit Hamifratz) as part of the city’s public transportation system. At Technion 12 columns and two stations are being built on campus. The project should be operational within two years.

## Completed

- **Schulich Faculty of Chemistry** – Renovation of laboratories and offices.
- **Rappaport Faculty of Medicine** – Renovation of new library.
- **Grand Technion Energy Program** – Research labs on an additional floor.
- **Henry and Marilyn Taub and Family Science and Technology Center** - Rooftop Terrace.
- **Rosen Solid State Institute** – Renovation of corridors and public areas; new entrance and site development; new lecture hall.
- **Ullmann Teaching Center** – Building reinforcement, additional elevators, addition of classroom floor (8<sup>th</sup> floor).
- **Southern Palm Beach Chapter Expansion of Students’ Counselling Center** – Additional wing and accessibility arrangements for physically challenged individuals.
- **Botnar Tower Dorm** – New air conditioning systems in building 961.
- **Canada Dormitory Village** – Renovation and air conditioning systems in buildings 933, 953, 954.
- **Sports Center** – Roofing the outdoor multipurpose sports court.
- **Teaching Facilities** – Ongoing renovation projects over the campus.



Taub Terrace



- **Various Faculties** – Renovation of Labs as part of recruitment for 35 new faculty members.
- **Accessibility for physically challenged individuals** - various projects in campus buildings and outdoor areas.
- **Campus Infrastructure projects and safety upgrades.**

## Construction

- **Technion Campus Gates** – construction of two new entrance gates: Susan and David Wilstein Main Gate (Nave Shanan) and Mertens Gate (Nesher).
- **Polak Visitors Center** – Enlargement of wing to the existing building for exhibitions.
- **Rappaport Faculty of Medicine** – Renovation and expansion of research labs.
- **Broshim Dormitory Buildings** – Two high-rise buildings for families, couples and singles.
- **Henry and Marilyn Taub and Family Science and Technology Center** – Learning center.
- **Faculty of Architecture in “Hadar” Campus** - Renovation and restoration of former library building to house exhibitions on, building an exterior elevator and site development.
- **Gutwirth Science Center** – Upgrading the air conditioning systems to conform to AAALAC standards in the pre-clinical research facility.
- **Mehoudar Creative Design Center** – within Danziger Building – workshop for models and prototypes and elevator between the floors
- **Forchheimer Tower Dorm** – New air conditioning systems in building 960.
- **Sports Center** – New multifunctional hall.
- **Teaching Facilities** – Ongoing renovation projects over the campus.



Ullmann Building

- **Various Faculties** – Renovation of Labs as part of recruitment of 40 new faculty members.
- **Accessibility for physically challenged individuals** in various projects in campus buildings and outdoor areas.
- **Campus Infrastructure projects and safety upgrades.**

## Planning Stage

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- **Zielony Student Union Building** – Expansion of 4<sup>th</sup> floor to house International Technion Societies Study Center.
- **Cancer Research Center** – New building near Rappaport Faculty of Medicine.
- **Rappaport Faculty of Medicine** – Renovation and expansion of research labs, upgrading fresh-air supply (Stage 3), new area for Clinical Skills Center (TCSC).
- **Electrical Engineering Research Building** – New wing as part of Andrew and Erna Viterbi Faculty of Electrical Engineering.
- **Sagol Center for Intelligent Composite Materials** – New laboratories wing as part of the faculty of materials science and engineering.
- **Student Dorms in “Hadar” Neighborhood** – Design competition for the planning of new dorm complex in Technion’s “Hadar” Campus.
- **Medical School Dormitory on Allenby Street** – Demolition of existing building and design of a new 220 bed building.
- **Andrew and Aviva Goldenberg Architecture Studio Pavillion** – New wing as part of Amado building to house studios.
- **New Building** – for Faculty of Aerospace Engineering.
- **New Research Building** - for Life-Sciences Laboratories.
- **Teaching Facilities** – Ongoing renovation projects over the campus.
- **Various Faculties** – Renovation of labs as part of recruitment of 35-40 new faculty members.
- **Accessibility for Physically Challenged Individuals** in various projects in campus buildings and outdoor areas.
- **Campus Infrastructure projects and safety upgrades.**

## Sustainability Hub

During the past year the Technion sustainability hub was integrated completely into the Construction and Maintenance Department (CMD). The responsibility and management of all sustainability issues had been transferred to the permanent staff of CMD. This organizational change will further increase the influence and engagement of the sustainability hub in campus operations.

The goal of the sustainability hub is to establish the Technion as a leading university in environmental policy and campus management, in Israel and worldwide, and as a sustainable campus, by:

- Preserving and nurturing the unique natural environment in which the campus is situated.
- Striving to become a zero-carbon emissions campus through energy conservation and increased use of renewable energy.
- Drastically reducing the use of non-renewable resources.
- Increasing its role in environmental research and innovation and becoming a global leader in the field.
- Educating students, staff, and faculty members toward environmental leadership and responsibility.

Activities through 2017 include education and awareness raising, resource saving (water, energy, waste recycling etc.), pollution prevention and definition.

As a part of the growing cooperation with the students' association, activities were initiated, aiming to increase the students' involvement in everyday campus life and sustainable management.

### Main projects in 2017:

- **Mapping and analyzing the recycling infrastructure:** map gaps and sustain efficient collection facilities.
- **Resources Saving taking part in and promoting energy efficiency and water saving projects:**
  - Mobile control of outdoor lighting through a designated control and management software, currently managing 80% of campus lights using an astronomical clock, monitoring sunrise and sunset times throughout the year.
  - During 2017 4 cooling chiller units were replaced in "Canada" building.
  - Activities to reduce electricity consumption in buildings, including re-location of systems to better locations in buildings.
- **Maintaining and updating "sustainability hub" website:** which serves as a center for updates and information on environmental activities on campus, <https://sustainability.technion.ac.il>
- **"Green Campus" Facebook page:** provides updates, green office tips and links to relevant articles from the web. URL of the Facebook page "Technion Green Campus" soon to be renamed as "Technion Sustainability Hub"

- The Technion green campus is a founder member of the **Green Campuses** Forum of universities and colleges around the country, to promote inter-university cooperation and alliance with organizations such as the Ministry of Environment and more.
- **Technion Greenhouse Gas (GHG) Emissions:** reporting for the seventh year – the GHG emissions are calculated and reported to the Ministry of Environmental Protection's Voluntary Greenhouse Gas Registration and Reporting Program.
- **Students Association activities:** included recycling DIY workshops (3 workshops, total of 80 participants), herbal medicine workshops, in cooperation with the ecological garden (2 workshops, total of 40 participants). In addition to these special activities, an ongoing effort is being made to raise awareness about sustainability and recycling through encouraging the use of multi-use cups in coffee shops, promoting paper recycling, especially during exams period, etc.

## Main plans for the coming year:

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- Continuation of all on-going projects.
- Cooperation with the students' association – waste collection infrastructure upgrade, bicycle repair and maintenance booth once a week, students' activities – lectures, DIY workshops, and encouragement of recycling.
- Promoting sustainable project on campus – renewable energy (solar panels on roof tops. 50 kWp planned, consisting of 3 different technologies and monitored as a research platform for students, energy efficiency (replacement of old chillers and outdated systems), water saving etc.
- Encouraging water reuse through air conditioning water collection in Taub computer science building.

# Human Resources

## General Activities

Activity has begun or is continuing in the following areas:

Organizational connectivity to improve the relationship and connection between administrative staff and the organization.

Negotiations with junior staff organization about job security and improving remuneration.

Human resource planning with various faculties in absorption of new faculty members

Personnel procedures writing new procedures and updating existing ones

Feedback process for permanent employees – A management tool was implemented for providing feedback to employees

Employing workers with special needs

Continued implementation of the SAP-HR system – In 2017, computerization was completed. Additional computerized tools were defined and developed to adapt the system to new changes and requirements, add new work processes, and streamline existing ones.

- In the employee clocking system, the ability for independent report output has been set up
- Production of instructional videos on the employee clocking system has begun
- Additional attendance report options were added for employees with a personal contract
- Improvement in the Training Division
- In the Retirement and Standardization Division, the process of managing retirement and departure in the computer system has been completed
- Implementing the new collective agreement with senior academic staff
- Automatic monthly importing of time reports and utilization of sick leave for senior academic staff was completed
- The process of calculating sick pay for academic staff
- The system of calculating benefits and sick pay for employees with a continuum of rights from another university was upgraded
- Organizational structure and employee distribution were updated and adapted
- Temporary Employees Division, a system created to manage retired employees who are temporarily employed
- New employee categories with special employment characteristics were identified
- Computerization of exam supervisors absence
- Personnel Division, the employee promotion process was transferred to the SAP system
- A new type of information system is available to the Tenure Committee

## Recruitment

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In the past year, the Recruitment Division focused on changes in the labor market which affect the scope and complexity of recruitment. In the Audit Committee last year, Technion's comptroller presented Technion's management and members of the committee with the main points of the report related to the recruitment process, employee selection and intake, and its conclusions. As part of the audit, opportunities for improvement were pointed out. This year, the Division implemented improvements.

## Outstanding Employees

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As part of Technion's Excellence Program, outstanding employees are annually awarded with certificates of recognition and bonuses in two categories, employees selected by individual department heads and five employees selected from all the faculty and department candidates.

For the first time, certificates of appreciation were awarded at Technion's annual appreciation ceremony in October 2017, attended by Technion's President, senior management, and about 1,000 employees and their spouses. As every year a festive breakfast was held for Technion's outstanding employees.

## Training

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In 2017, the Training Division identified needs and adapted the instructional system after meeting with steering committees.

Concurrently, department heads examined the needs of their employees with the aim of providing relevant instruction; strengthening collaborations within Technion, which encourage effectiveness; and maintaining excellence and organizational pride.

In 2017, the Training Division chose to emphasize the following topics:

- Improving interpersonal communication and teamwork
- Decision-making and implementation
- Self-efficacy
- Leveraging organizational motivation and connectedness
- Managerial tools for inspirational leadership
- Creative and experiential team-building workshops

## Employee Welfare

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The Welfare Division makes an effort to participate in the events of an employee's life throughout his or her employment at Technion, as well as to hold various welfare events throughout the year.

Social Support - Eshhar – Social and Community Services

Every year, Technion employees who are forced to cope with illness, distress, and other hardships are assisted by social workers and psychologists who specialize in specific areas.

Illness Support and Health Program

The Welfare Division (in cooperation with management) accompanies Technion employees with a long-term illness and serves as the connection between the employee and the various administrative bodies at Technion (human resources, salary, etc.). Support includes visits, conversations, rights guidance, filling out forms, sending personal holiday greetings, help with pension funds, and more.

Competitive sports - In 2017, Technion employee sports teams again participated in the league for workplaces.



#### Social Events:

- A 25-year employees' ceremony, in which a certificate of esteem and appreciation was presented to 77 veteran employees and faculty.
- Bar/Bat Mitzvah event in the Youth division Science Programs – a scientific day for employees and children.
- “Hello, First Grade” – A festive family event to celebrate the start of first grade.
- Outstanding Employees Evening – A major event attended by employees and their spouses, which took place in October 2017.
- Traditional Hanukkah party for Technion retirees
- Rosh Hashana Gifts and Gifts to employees for life events.
- Employees and faculty were given the opportunity to choose the gift they would receive for Rosh Hashana.

#### **NewTone Choir at Technion**

The NewTone choir established in 2016 is made up by employees. It has performed at major Technion events, and has represented the Technion at external singing conferences and performed a total of seven times. The choir significantly increased the sense of connectedness and pride for its members and the other employees.

#### **Retirement Preparation Program**

In November 2017, a retirement preparation program was held for 50 employees and faculty members who were about to retire from Technion. The program includes varied lectures in relevant areas such as taxes before retiring, social insurance, health and nursing insurance, options for volunteering after retirement and more.

#### **Website for the Human Resources Department**

In 2017, a project was launched to build a new website for the Human Resources Department. The site is meant for both Technion employees and faculty as well as potential candidates.

#### **“Connected to the Community”**

The “Connected to the Community” project was built over the past year to increase the number of Technion employees who take part in volunteer activities in various parts of the community. The project was launched after an extensive survey was distributed to employees, which showed that many are very willing to take part in various volunteer projects. In recent months, conferences have been held with charities to present the project to employees. Projects included in the program are: Lev Chash Association, the non-profit ELEM, After School Programs in Neshet and Haifa

Additional volunteer opportunities will be examined throughout the year.

## **Retirement**

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The retirement process is mostly carried out in the Budget and Retirement Division, with interfaces with the Payroll Division, the Reporting and Control Division, and the various faculties and units. The process of dealing with retirement is similar for administrative and academic staff.

A review of the retirement process for administrative employees was conducted from December 2016 to March 2017, to examine the work process and manner of handling the matter at Technion. The report's conclusions were presented to the Executive Committee, which was impressed by the rigorous and caring way that retirement is processed.

As part of the audit, documents, calculations, laws, and procedures were examined. Meetings were held with the relevant personnel in the Human Resources Department, with heads of departments and management, as well as with employees who are pre- and post-retirement.



In addition, meetings were held with representatives of retirement departments in other organizations (TRDF, Zim, and Rafael) to compare their retirement processes to Technion's and to examine possibilities for streamlining the process.

The audit's findings show that the retirement process, which is mostly conducted by the Budget and Retirement Division of the Human Resources Department, is organized based on clear guidelines and work procedures.

The report's main recommendations relate to improving and streamlining the process by retaining information and managing the tasks relevant to the retirement process using one computerized information system that will serve as a centralized data base, accessible to the employees participating in the process.

In addition, it was recommended to set up alerts in the system regarding irregular issues in pension calculations, summoning employees to a retirement conversation, and beginning the recruitment process ahead of the outgoing employee's expected retirement date.

Furthermore, it was recommended to remove unnecessary access privileges for viewing data on the hourly wages of Technion employees and to create a computerized checklist that would enable monitoring the status of the employee's retirement process.

According to the audit, taking the actions specified in the report and implementing its recommendations will help improve and streamline the retirement process and make it easier to manage information and monitor the tasks related to the process.

The Retirement Division is currently working with the Information Systems Department on implementing the recommendations.

## Standardization

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A few years ago, we implemented a process of personnel planning together with department and faculty managers. The goal is to streamline the process of human resource management in the organization. For this purpose, an orderly process of strategic planning meetings was established.

## Strategic Planning

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Strategic planning meetings are held once a year to discuss the status of human resources in faculties, address various issues, and improve support for administrative and unit heads.

## Budget Committee

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In the summer, the Budget Committee discusses the requests submitted by departments and faculties regarding staffing requirements for the upcoming calendar year. Around September, the Budget Committee responds, and departments begin to plan accordingly. A Department Head may appeal the Budget Committee's decision.

## Academic Staff

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From September 21, 2017 through September 9, 2018, Technion recruited 26 new faculty members (as of February 15, 2018).

The Academic Staff Division continues to focus on improving the absorption process for new faculty members and integration into Israel, as well as that of their families.

In addition, the Division continued to strengthen contact with veteran faculty members at Technion, while improving SAP integration with the staff portal, and dealing with issues such as tuition fees, sick days, housing, full-time deduction grants, work accidents, unpaid vacation, maternity leave, staff cards, supplementary responsibilities, automation of personal information, and more.

## Computing and Information Systems - CIS

The computing and information systems division was formed in 2011 by merging the Information Systems Department and the Taub Computer Center. One major concern was and still is operation from separate buildings. Significant efforts are being made to raise a fund for moving the two units into one modern building. This will surely improve the functionality and the daily operation of the CIS division.

A major concern today is the very old Data Center that resides in the Taub Computer Center. A new Data Center should be planned for the years to come.

### Campus Management Module – SAP SLCM

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The Campus Management Module, the SLCM – Student Life Cycle Management, is the last major function that is still operating on the old IBM Main-Frame. The public tender for the Blue Print was completed and the winning vendor was HP Corp, now known as – DXC Corp.

The project is now in the Third and final portion of the Blue Print. The plan is to complete the Blue Print by the end of the summer 2018, and implement it, which will take about two years. The Blue Print project is being led by Prof Emeritus Moshe Shpitalni. Several teams and a Steering Committee were created.

### HR Module Implementation (SAP)

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The Human Resources module went live in January 2014. This application covers three offices: HR Division of Technion, HR Department of TRDF and the Academic Staff Office. This project has had a significant impact on all employees.

On-going operations are working fine and additional functionality is being added to this application.

### Website development and the new Accessibility regulations

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Since 2013 the CIS Division created a new infrastructure for developing websites, based on Word Press technology, in which end users with no computer skills can develop their own websites, based on templates. In the last three years new regulations to assist disabled people were enacted in Israel, and in order to comply the Division is working to alter existing websites. We made the required changes to Technion's main website and it has achieved Access Israel certification. The 700 web sites that were developed based on the Word Press also comply with the new regulations.

## Virtualization of Servers

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The majority of servers were moved to a new environment using virtualization tools. About 90% of the servers in the Division are virtual, which allows improved and more reliable services while using less hardware and electricity.

## Improving Data Security Infrastructure

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One of the major threats of the computer world today is data security; a significant portion of the annual budget along with major efforts are dedicated to the integration of cutting-edge technology to detect and prevent security infringements. A large project of implementing a new cross Technion McAfee Anti Virus has been completed. In data security fighting malicious software is a continuous effort that requires investment in budget and manpower.

## Mobile Applications

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In 2015 we developed a new application for mobile devices, target users are Technion's students. The application aims to provide solutions for many daily services that students require. The new mobile application translated into English, Chinese and Arabic, was adopted by the students quickly and is being used widely. New functionality is being added all the time.

## Cloud Computing

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We completed the utilization of Cloud services for e-Mail and some other IT services. All e-mail services of the Technion are based now on Cloud services. Other operations moved to the cloud recently include: PC Backup by Druva, Storage by Dropbox, and e-Learning by Panopto.

We are now installing a new service, HPC in the cloud. We are planning to implement more cloud services.

## Disaster Recovery Plan

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Moving essential services to the cloud provided a portion of the disaster recovery solution, although other IT applications are still running on premises. The previous DRP is being updated to reflect cloud services. We are combining the DRP revised plan with the Backup System needs.

## SAP Portal

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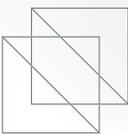
Last year new electronic forms were adopted to replace exhaustive manual processes, which allow the automation of a process from beginning to end and target the most popular and complicated processes; they significantly expedite manual processes, shorten the cycle time required, and have received excellent feedback from academic staff. A new web-based application was added to the portal: researchers will publish their areas of expertise as well as special projects, so that donors can be presented with this information quickly and easily.

## HPC – High Performance Computing

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HPC at Technion is growing. The current cluster started with 1,000 Cores in 2012, and is currently composed of 3,500 Cores.

The needs of the research are constantly growing and we are looking into HPC cloud based services as well as on premise solutions. Our target is having a Hybrid solution for researchers that will be based on Cloud HPC services as well as on Premise HPC nodes.



## Organization and Systems Unit

The Organization and Systems Unit is responsible for evaluating organizational-operational functions (assessing work processes, recommendations for improvement, business analysis, and job definition); characterizing needs and defining information system requirements; integrating and customizing off-the-shelf software; data collection and processing; updating and writing procedures; and handling and publishing data regarding candidates, students, and alumni.

### Organizational and operational reviews

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#### International School – Operations

- Defining the preparation process for automation as a form on the portal
- Supervising automation of the form on the portal

#### Writing, Updating, and Publishing Technion's Procedures

- Updating the procedure work plan for 2018/2019 – Currently, 69 issues are defined in the work plan as requiring new procedures.
- Writing new procedures and updating old ones – In 2017, 48 procedures were written and updated, of which 20 procedures were signed and published on the Division's site.
- Translating procedures into English – Defining a work plan for 2018 and detailing procedures that need to be translated into English. Procedures were evaluated giving priority to procedures that support work processes, which are also carried out by an international population.

#### Procedures were translated into English work included:

- Meeting with professional bodies responsible for the procedure
- Consultation with legal counsel
- Obtaining permission from work committees and approvals from management

### Main Technion Projects

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#### Risk Management system

- Validating the risks defined in the risk survey of 2013
- Actions and follow-up on issues selected for the implementation of a risk management system:
- Chemical warehouse – inadequate inventory management
- Public Relations – decrease in the scope of fundraising, fundraising for non-priority causes, improper donation management, reduction or non-distribution of projects to fundraising
- Finance – actuarial deficit
- Human Resources – prolonged downtime of academic staff, administrative staff, or students

- Liaison Unit - reduction in receipt of European research grants

#### **Actions taken include:**

- Meeting with unit heads and other relevant employees
- Recommendations for each risk defined and task allocation accordingly
- Establishing a responsible party and timeline for executing each task
- Performance reports to the Risk Management Committee, which includes the Executive Vice President, Chief Executive Officer, VPs, the responsible party, and the organizational and method specialist

## **E-mail accounts**

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Technion management has decided that there is a need for functional e-mail accounts. The objectives are:

- Email address format uniformity
- Preserving information and retrieving it from the email account easily

#### **Progress in 2017 included:**

- Defining a uniform format for functional email accounts
- Defining process and factors required for implementation

## **Making Technion's services accessible**

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Technion, as a public academic institution, is required to make accessibility adjustments for students and guests with disabilities, in accordance with the Equal Rights for Persons with Disabilities regulation (service accessibility adjustments), in order to allow equal participation in studies and events.

#### **Progress on this issue in 2017 included:**

- Defining an appropriate process and procedure for lending audio kits to students and guests with hearing disabilities
- Defining the required adjustments and equipment for events at Technion

## **Integrated Technion Events Calendar**

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Technion hosts various events throughout the year: conferences, seminars, open house events, special visits, etc. Executing some of these events involves the use of central resources and guidelines that affect the campus, such as use of the Churchill Auditorium, closing main roads, closing off parking spaces, etc.

There is currently no platform that provides the list of all the events and includes the various guidelines and implications for the campus.

#### **Progress on this issue in 2017 included:**

- Defining needs and requirements and beginning the project with the Computing Division

## **Processing data on candidates, students, and alumni**

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#### **Progress on this matter includes:**

- Classifying academic tracks and new programs to be reported to the Israeli Central Bureau of Statistics (CBS)
- Addressing inquiries from the CBS
- Preparing key reports for the CBS
- Preparing statistical analyses in accordance with requests from management, which aid in decision-making



## Safety and Health

Preventing work-related accidents and incidents has become part of the Technion culture. The main goals of the Safety & Health Unit to take the necessary actions to minimize accidents and occupational illnesses, and to comply with safety laws and regulations. The actions taken are intended to promote the safety and health of staff, students, visitors/guests and contractors on campus. A comprehensive Safety & Health action plan has been developed and implemented. All numbers (in parentheses) in this report represent the previous year's data.

### Work-Related Accidents and Incident Indicators

The number of reported work-related accidents in the year 2017 was 14 (24 in 2016) with an accident rate of 0.27 (0.47) accidents per 200,000 working hours.

These accidents resulted in the loss of 137 (348) working days and a severity rate of 2.67 (6.78) lost work day cases per 200,000 hours.

Figures 1 and 2 reflect the annual accidents and severity rates in the years 2012-2017.

Analyzing the annual accident rate from the years 2012- 2017 shows a continuous improvement in this area.

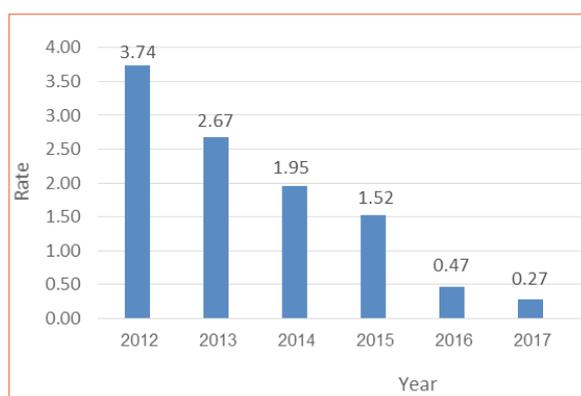


Figure 1: Yearly Accidents Rate Comparison

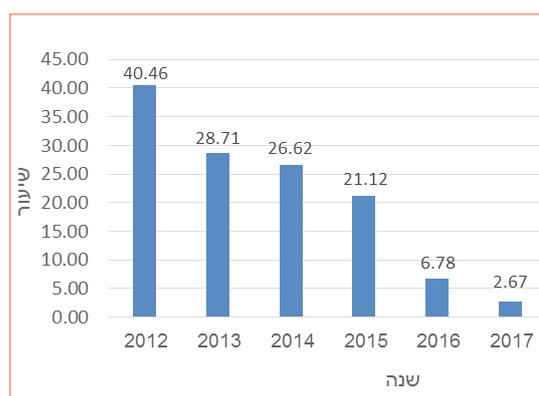


Figure 2: Yearly Severity Rate comparison

30% of these accidents were not related directly to the Technion's activities but to other causes (e.g., accidents on the way to/from work).

## Risk Assessments and Implementation of Standards

Over the past few years, a systematic risk survey was carried out in laboratories and work areas, as well as in areas that have undergone major changes or renovations, to identify main risks and implement risk control measures. An overall of 97 (44) risk surveys were carried out including surveys of laboratories and areas after renovation or construction prior to occupancy.

1,276 corrective actions were recommended to the faculties involved.

## SIP: Safety Improvement Projects

The Unit manages an annual budget for safety improvements projects in the sum of 2.7 million NIS.

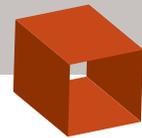
Below are some examples of the safety projects completed during 2017:

- Replacement of Emergency Evacuation light in several faculty buildings
- Installation of fire alarm systems in the student dormitories -Continuous project
- Upgrading of safer Bunsen burners in research and student laboratories in the Rappaport Faculty of Medicine
- Installing railing and ladder to the rooftop of a laboratory at the Aerospace Engineering building
- Purchase of a live fire simulator for drilling the ERT (Emergency Response Team)
- Replacement of unsafe electrical panels in the Main library building
- Installation of water sprinklers in the Faculty of Electrical Engineering
- Replacement and renewal of asbestos chemical hoods -Continuous project
- Upgrading of chemical hood exhausts in accordance with Israeli Standard 1839 in the Faculty of Materials Science & Engineering
- Removal of old and unsafe gas cylinders from the Technion Campus -Continuous project



New lab in Biotechnology and Food Engineering





## Renovation and Construction Safety Guidelines

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The Unit participates in all renovation and construction activities in every area of the Technion's activities. The Safety Unit issued 73 (51) safety guidelines for planning new or renovated laboratories.

Most of the safety planning guidelines, 9 (7), were for the renovation of laboratories in the Rappaport Faculty of Medicine. Additional guidelines were submitted for the Faculties of Biology and Aerospace Engineering – 5, 6 accordingly (6), and 7 for the the Viterbi Faculty of Electrical Engineering and the Faculty of Civil and Environmental Engineering – 3 each.

## Safety Support: Aerial tramway transportation Technion-University Project in Haifa

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The city of Haifa and "Yefe Nof" company started planning the aerial tramway project. The aerial tramway will connect the transportation terminal in the Haifa bay with the higher education institutions on Mount Carmel, serving the population and adjacent neighborhoods, easing parking and traffic congestion.

This project is considered a "green project" from an environmental point of view.

The projects consists of two stations and several high supporting posts all around the Technion campus area.

During 2017 (and the years before) the safety unit accompanied this project with collaboration of the "Yefe Nof" representatives.

Following are some of the activities:

- The unit received and examined all the "Yefe Nof" safety experts' Risk survey reports and gave the Technion vision for project management.
- Issuing preliminary guidelines for the execution phase.
- Negotiating with "Yefe Nof"'s safety experts regarding budgeting of safety projects and improvements required uring the execution phase.

## SMCP: Safety Management Computation Projects

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During 2017, the Safety & Health Unit and the Technion Computing Division developed several computing applications projects intended to assist the Safety Unit in managing safety & health issues and complying with Israeli safety regulations at all Technion sites.

Periodical Safety Equipment Checkout Application – The highlight of this joint activity was the development and establishment of an ERP (Enterprise Resource Planning) system for managing and conducting periodical equipment safety checks. The application can, and in fact does, summon the relevant auditor and alerts all relevant individuals regarding the status of the safety inspection.

LSS App for Weekly Automatic Defibrillators Inspections – In addition to the above, a new SAP-based application was developed to assist in the performance of weekly and periodical inspection of LSS (Life Saving Systems) stationed in Technion buildings and facilities. This application uses the mobile phone as the inspection reporting media using the Barcode technology.

Safety Training Management System – During 2016, the Unit issued planning master guidelines for the management of all safety training on campus in the ERP system. This project is scheduled for implementation during 2017-2018 by the Unit with the assistance of the Technion Computing Division.



## Emergency Preparedness

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In the area of emergency preparedness, the main activity was the training of around 120 Technion employees as Emergency First responders in cases of fire and other safety emergencies. Each training and practice course lasted 3 working days.

In addition 5 main evacuation drills were carried out during the year 2017. The buildings' evacuation staff were trained by the Unit prior to commencing the drills. The drills were analyzed, and conclusions and corrective actions were issued to the participants.

## Comprehensive Safety and Health Action Plan

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For the upcoming year (2018), the Unit developed a comprehensive Safety & Health Action Plan. The plan was presented to and approved by the Director General and Technion's Safety & Health Committee. This Action Plan consists of timelines and a budget for safety & health roles and activities in 2017.



## Security Department

In 2017, the security unit focused its efforts on construction projects and various security issues.

- **Security concept and strategy:** The unit's security concept was updated to conform to instructions from the Israel Police and take potential threats and scenarios from 2016-2017 into account. The security directives for 2016 were upgraded and authorized by the Israel Police's Haifa branch.
- **Transfer of the unit's administrative center to the Taub Computer Center:** In accordance with Technion's Security Director and approval by the Israel Police, this year the security center moved to the heart of the campus in order to enable the Center to function more efficiently in times of emergency. The project was funded by Richard and Kenneth Skodnek.
- **Technion Gates Project:** Construction work has begun. The project was funded by David and Susan Wilstein. A contractor was chosen to handle the installation and operation of CCTV cameras at all roundabouts and bus stations, as part of the Security Director's concept of security and in accordance with instructions from the Israel Police in response to the problem of checking public transportation at Technion's gates. The security unit accompanies the construction at various stages, among other things, in order to allow the entry of vehicles during construction work.
- **Adjustment of parking ticket:** In accordance with a management decision and after a warning period, tickets were issued to all drivers who violate the parking procedures on campus.
- **Deficiencies in the Technion Comptroller's report regarding the security unit were taken care of.** The final report was approved by the Audit Committee.
- **Security employees underwent training in the following areas:**
  - First aid
  - Safety
  - Proper driving
  - Extinguishing fires
  - Elevator extraction
  - Krav Maga training
  - One-day refresher course in accordance with instructions from the Israel Police
  - Call center employees underwent a special four-day training course in accordance with instructions from the Israel Police.
  - Shift managers underwent a special four-day training course in accordance with instructions from the Israel Police.
  - **Welfare activities for employees:** The security unit employs about 60 security guards through

an external security company and approximately 80 students directly (most of them from Technion). In an effort to strengthen employee loyalty to Technion, raise morale, and create a team spirit, special team-building activities were carried out and bonuses were given to outstanding security guards.

- A service orientation workshop was held for all security guards.

The Israel Police approved the Security Director's security concept for both the main Neve Sha'anani campus and the Faculty of Medicine (downtown). The approval is valid for the next 5 years.

- Investigations of all unusual events on campus were conducted, some of which led to the arrest of suspects.
- The security unit handled about 300 security requests at Ben-Gurion International Airport, thus facilitating entry and exit of foreign guests into and out of Israel.





## Public Affairs and Resource Development

Technion continues to raise the bar, both in terms of its international visibility and its fund-raising achievements. With an overarching goal to promote relationships with and seek financial support from our global network of societies, to build the Technion's brand and enhance its reputation and visibility, PARD has been restructured to ensure these goals are met and exceeded. For the third year in a row, funds raised last year exceeded \$100M setting the Technion as the most successful Israeli university in that field. The inauguration of Technion's new permanent campuses in New York and Guangdong continued to attract world-wide attention; collaboration agreements with leading universities add strength and recognition to the Technion's brand name; an ever-increasing number of visitors to the Technion campus experienced first-hand the special Technion "touch" – the unique ecosystem of innovation and entrepreneurship that has become a role model for numerous organizations trying to follow our footsteps. This could not have been achieved without the hard work and devotion of the Technion supporters around the world -- an extraordinary group of people who are highly motivated and dedicated to the cause.

Technion continued to advance and expand its global profile in the past year. In New York, the Jacobs Technion-Cornell Institute moved into its new home in the completed Cornell Tech campus on Roosevelt Island, which was inaugurated in September 2017. Thousands were present at the historic inauguration ceremony, which featured high-ranking officials, politicians, diplomats, media teams and academic as well as business leaders from around the world.

In China, the new campus of Guangdong Technion – Israel Institute of Technology (GTIIT) was inaugurated on December 18, 2017. The Technion delegation to the historic event, led by President Lavie, included over one hundred guests – faculty, representatives of the associations and friends and supporters of Technion from around the world, Israeli dignitaries and media personnel.

These historic events were another major step forward in our quest to become one of the leading science and technology universities in the world. Together with our endeavors in China and New York City, and other strategic international collaborations, the Technion is well on its way to become a world-renowned powerhouse in science, technology and innovation — and this is manifesting itself east and west.

### PARD Leadership

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Prof. Boaz Golany continues to serve as the Vice President for External Relations and Resource Development, a position he has held since January 2012. Following the organizational change in PARD, it now consists of three units: "Resource Development," "Events & Hospitality," and "Communication

& External Relations.” After the departure of its former head, Mr. Richard Tabachnik, Technion is now in the process of hiring a new head for the Resource Development unit. Events & Hospitality is led by Ms. Zohar Nathanson who joined Technion after serving in the Israel Air Force for 25 years, in various administration and leadership positions. In her last position, she served as Head of Foreign Affairs and Protocol. Leading the External Relations unit is Mr. Gil Lainer, former Technion spokesperson. The responsibility of Secretary to the Board of Governors continues to be handled by Advocate Asaf Binder, Secretary of the Technion Senate.

## Resource Development Unit

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The number of fundraising projects produced by the Project Development Unit continued to grow and the portfolio of available projects became more diverse than ever before. As well, the number of large “mega-projects” requiring tens of millions of dollars each, has increased dramatically in the last year. The new line of “Focus Area” projects, which was launched last year has proven itself useful and resulted in several million dollars of flexible funding for the purposes for which it was designed. PARD continues to make its information more accessible to the societies by offering a research portal with search capabilities to look into research funding opportunities. In addition, a comprehensive project database where professionals can search and download the latest proposals on all subjects is now available to all our societies. As we are constantly striving to be responsive to our donors, our stewardship is constantly evolving as we better our internal systems and our methods of keeping the best contact with them.

The Technion recently embarked on a Technion Global Capital Campaign, the objective of which is to support the Technion vision statement of becoming one of the 10 leading universities of science and technology worldwide.

The Campaign goal is to raise \$1.5B over a period of 10 years – from 2015 to 2024 (\$1.2B from the USA and \$300M from the rest of the world) in the following categories: faculty recruitment & retaining; fellowships (grad students, postdocs); research infrastructure; physical development; research projects; students support; Jacobs Institute; and unrestricted funds.

## Projects

The Projects Unit is responsible for translating Technion’s funding needs, as determined by Technion management, into project proposals and materials for use by fundraisers and societies. This year again, the unit prepared approximately 350 new projects.

This past year, close to 200 projects of varying levels were adopted, including: the Helen Diller Quantum Center; the André Deloro Building for Biosciences, Medicine and Engineering; dormitory wings and apartments within the Undergraduate Student Village; support of the Center for Security Science and Technology and homeland security research; faculty recruitment; establishment of the Azrieli Genomics/Epigenetics/Bioinformatics Core and Annual Workshop on “Frontiers in Cancer Research and Therapy” in the Technion Integrated Cancer Center; establishment of the Sagol Center for Intelligent Composite Materials in the Faculty of Materials Science and Engineering; the Fujiwara Cyber Security Research Center; establishment of the Mauerberger Foundation Fund Prize for Transformative Technologies for Africa; establishment of the Avie and Sarah Arenson Built Heritage Research Center; as well as continued solid support of the top priority project, graduate student fellowships.

Projects in the works in terms of fundraising include naming opportunities for several faculties; additional support to the Technion Integrated Cancer Center (TICC); expansion of the Diabetes Research Center; and construction of a Research Building in the Viterbi Faculty of Electrical Engineering, the Northern Dormitory Complex, the Technion Clinical Skills Center in the Rappaport Faculty of Medicine, and the Health-Food Innovation Center in the Faculty of Biotechnology and Food Engineering.

This year, the Technion Priority Projects website was launched, displaying all Technion management



approved priority projects in three categories: Academic Support, Research Support, and Physical Facilities. The Research Portal containing research projects submitted by Technion faculty members is continuing to prove its effectiveness in attracting donors to the interesting research being carried out in diverse areas.

Our goals for the upcoming year include the following:

Increasing the number of projects supported and use of the Resource Development portals

Enhancing relations with our Technion Societies around the world

Continuing to focus on the needs of our donors

Tailoring Technion's high priority project needs to potential funding sources

## Donor Relations

The Donor Relations dept. is responsible for the maintenance and cultivation of long-term relationships between the Technion and its donors. As such, it provides a wide variety of services to Technion societies and individual donors, including periodic reports, special updates and summaries, pictorial overviews and short digests on donor-supported projects. In addition, the unit personnel take care of donor- and gift-related information requests, from both internal and external sources; prepare a variety of letters and other donor correspondence items; and maintain the division's computerized fundraising and donor information management system (CRM). Each year, the unit processes several hundreds of reports on chairs, research funds, capital development projects, lectureships and prize funds, for a wide range of donors. In addition, PARD scholarship and fellowship coordinator handles close to 1,700 funds for which she provides annual reports and thank-you letters. Finally, donor relations staff routinely draft recognition, appreciation, condolence and greeting letters, as well as other correspondence items, for members of the Technion administration.

To increase efficiency and responsiveness, over the past year, considerable attention has been dedicated to aligning PARD reporting schedules with those maintained by the Technion societies. As part of this effort, reporting tasks have been re-evaluated and re-assigned, the division of labor between PARD and the Technion Societies revisited and re-defined, and priorities re-formulated.

The department's staff continued updating and upgrading the division's CRM system introduced almost 10 years ago. Our most recent work involved restructuring specific parts of the system and adding fields, to facilitate more sophisticated management tools, produce more comprehensive reports and improve user experience. The PARD database is scheduled to undergo further enhancement later in the year, when parts of it will be synchronized with the new donor database currently implemented by the American Technion Society.

On another critical front, the internal workflow and procedures between the projects and the donor relations departments have been revised to ensure streamlined approach to donors, projects and donor relations and recognition. Close collaboration between the two departments ensures seamless integration between the proposal phase and later stages in a project's life, in terms of budgeting, expected outcomes, donor recognition and reporting routine.

## Communication and External Relations Unit

The Communication and External Relations Unit connects Technion with strategic stakeholders such as alumni, government agencies, media, and the general public, in Israel and the world. It includes the office of the spokesperson, the marketing department and the strategic communication department. The unit produces content for local and international media, including press releases, campaigns, videos, digital and print media, in order to advance the Technion global brand.



## Messaging

The Communication and External Relations Unit has continued its work towards developing global unified marketing and communication messages aimed at existing as well as new audiences.

Under the guidance of Technion management and following discussions and consultations with various shareholders, three key messages the unit focuses on promoting were identified: Excellence in research; Technion's unique ecosystem of innovation and entrepreneurship; Globalization.

The three key messages above are regarded as principle guidelines. Subsequently, all content and messaging coming out of Technion via the Communication and External Relations Unit, across all major platforms is aligned with at least one of these key messages.

Additionally, the topics of Israel's 70<sup>th</sup> anniversary and the Technion Global Campaign have been identified this year as areas of significant importance to Technion and both have been and will continue to be treated as such until the end of 2018 and throughout the duration of the campaign respectively.

A specific messaging and PR strategy has been developed for each topic, based on the overhaul goals and strategies outlined by the Vice President for External Relations and Resource Development as well as Technion's key messages detailed above. Some of the actions taken have included special events, dedicated websites, video clips, items in the media etc.

## Media Exposure

Increasing Technion's exposure in the media, both in Israel and worldwide, continues to be at the focus of both the The Communication and External Relations Unit as well as Technion societies worldwide. The Technion spokesperson's office focuses its efforts on proactively creating press releases, visual materials and media placement of Technion faculty, students and staff in media outlets worldwide. The stories promoted include new research, events and visits on campus, symposiums and conferences featuring participants from Technion, student projects, notable alumni etc.

Special emphasis is given to promoting and organizing visits on campus of Israeli and international journalists. These visits are found to be highly effective as they generate not only media reports as a direct outcome of the visit, but also a better knowledge and understanding of Technion. This later manifests itself in additional positive coverage as well as placement opportunities etc. in its effort to increase the number of visits of this nature, the Communication and External Relations Unit partners with Technion societies, Israeli government agencies and ministries as well as the media outlets themselves. Special attention was given to the opening of the overseas campuses. This included circulations of press releases and visual materials, media placing of Technion officials, social media etc. Technion delegation to China included two reporters from Israeli leading media outlets.

In 2017, some 17,406 articles and news items featuring Technion were published in major newspapers and websites worldwide. 98.1% of these stories were classified as either "Neutral" or "Positive," while the remaining 1.9% reflect a "Negative" sentiment. These numbers reflect a rise in the general number of articles, which can be attributed, among other factors, to the opening of the new international campuses. The numbers also indicate a decline in the number of articles classified as "Negative". This can be partly attributed to strong action and legislation taken by some western governments, NGO's and academic institutions to combat BDS. Technion, with its international recognition and reputation as a world leader in many areas, has often been a target to BDS, sometimes ahead of the State of Israel itself.

Some notable examples of major media outlets that carried positive articles about the Technion include:

- An article in the **New York Times** about the inauguration of Cornell Tech.
- An article in **PC Magazine** focusing on JTCI





- An **NBC News** story about cultured meat featuring Prof. Shulamit Levenberg's research.
- An article in **Ha'aretz** (English) about Technion being ranked 1<sup>st</sup> Worldwide in Digital Education
- An article in the **People's Daily** about the opening of GTIIT
- An article in the **New York Times** featuring Prof. Hossam Haick's research.

### Marketing and Branding

The marketing department focuses on recruiting new students to the Technion. Its activities include a variety of events, campaigns and other activities intended on featuring Technion to prospect candidates. These activities include extensive usage of innovative digital marketing techniques as well as more traditional methods. All are geared towards insuring Technion attracts the best candidates available.

In an effort to improve the recruitment process and insure Technion continues to be an attractive and viable option in the eyes of the Millennials and Generation Z candidates that are now the vast majority of high education prospects, a major overhaul of the recruitment strategy is now in progress. Technion has switched its activities from a campaign to an "always on" mode of operation. The annual major "Open House" event has been replaced with a number of smaller, better targeted exposure events. In addition, a more personal approach to candidates was adopted – candidates receive personalized messages, phone calls etc. based on their own personal interests and grades. Upon arrival to one of the exposure events they are given name tags and visit the faculties of their choice.

The implementation of the new strategy and approach to recruitment will take a few years to be completed. It is however vital in order to insure Technion's advantage in recruiting excellent students in the face of growing competition and the changes the digital age has brought with it.

### Social Media and Strategic Communications

The Communication and External Relations Unit continues to cultivate a strong presence for Technion in the world of social and digital media. In a time when the reach and influence of traditional media is ever changing, the importance of these channels, which enable us to reach our target audiences directly, is ever growing.

Technion continues to follow a social media philosophy of reciprocity, sharing and engagement across the social media. The Technion Facebook page in English, which is a hub for our global community of friends and supporters, has 26,106 active followers. Our Hebrew Facebook page, with its 75,885 followers, is quickly becoming a social media focal point for those seeking scientific and innovation related stories. These include a considerable number of influencers such as science reporters, bloggers etc. Both pages' followers continue to grow in a steady, slow pace, even following recent changes by Facebook of its policies with regards to sharing content etc.

The Technion website in English and Hebrew continues to be a major source of information. This is true not only to those seeking specific information about Technion, but also to people interested in science, technology and innovation in general. We believe that our efforts to continue and maintain a constant newsfeed on the website is a key contributor to millions of monthly visits.

These principals are at the heart of our plans to launch our new website in the coming year. The new website will continue to feature a mixture of news and useful information in a variety of fields. We will continue to increase the use of visual materials when possible and incorporate our social media channels into the new website as well. As the number of users who view content almost exclusively on their smart phones, special attention is given to the issue of compatibility of content over all platforms.

On Twitter, Technion has close to 50,000 followers with over 11,000 tweets. The account is a hive of news and interaction. Technion Twitter also plays a hospitality role in welcoming international



guests to Technion and retweeting them, as well as an informational role in answering questions and sending Twitter users to relevant links.

As the importance of video materials, on social media and in general, continues to grow exponentially, Technion is well positioned to answer this trend. With Some 4,200 videos, currently online on the Technion YouTube channel' it continues to be highly popular, with over 23,600,000 views and 26,000 subscribers, by far the most of any Israeli university. Many of these videos are also used on Facebook and the websites.

## Events and Hospitality Unit

The unit supports PARD's goals by producing events and visits according to Technion's spirit of innovation and excellence. The Visitors Center hosts a wide variety of visits including Academic, Business and Official delegations as well as tourist from all over the world.

The department of Ceremonies and Events plans and carries out academic ceremonies and special events. The department also produces donor related ceremonies and inaugurations as well as plaques, to recognize the generosity of individuals who have been associated with the Technion over the years.

### Events, Ceremonies and Donor Recognition

The unit is responsible for a wide variety of donor-related, academic and general ceremonies and events, including those of the annual Board of Governors Meeting. Furthermore, the department deals with the installation of plaques honouring donors and special gifts.

Over the past year, we produced 51 ceremonies.

We prepared 13 gifts with dedication plaques; we installed 41 new recognition plaques and renovated 7; the refurbishment of the existing plaques on campus is an ongoing process.

We updated the gifts list and produced a new gift to be given by the president.

We continue to provide donors for major projects visualization of their donor recognition plaques before final installation, and we are preparing digital imaging of plaques for information.



Visit at Technion: Deputy Mayor City of Beijing (R), Prof. Dan Shechtman (L)





## Visitors Center

The Technion Visitors Center is the portal for thousands of visitors from around the world who want to learn about the Technion and its achievements. The Visitors Center staff receives and processes all visit requests – individual and group – and coordinates all aspects of the visits. In the past year, the center hosted over 7500 guests and coordinated 670 visits, an increase of 6% in the number of visits since last year. (A list of selected visitors is attached as an appendix to this section). The requests, from national and regional governments across the globe, who want to learn about Israel's success in entrepreneurship and innovation, and Technion's leading role in the Start-Up Nation phenomenon, continues to grow.

Due to the growing interest in the Technion and in the hope of exposing the Technion to an even greater number of people, the new Polak Visitors Center will be inaugurated in June 2018. The hope is that this will greatly enhance the center's attractiveness and ability to convey the Technion's story and key messages.



Visit of Baroness Ariane de Rothschild (L), Pres. Peretz Lavie (R)

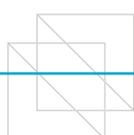


Presidents Report Category	
Ambassadors	H.E. Mr. Jean Daniel Ruch, Switzerland Ambassador to Israel
	H.E. Mr. Pavan Kapoor, India Ambassador to Israel
	H.E. Mrs. Helene Le Gal, France Ambassador to Israel
	H.E. Cao Tran Quoc Hai, Vietnam Ambassador to Israel
	H.E. Koji Tomita, Japan Ambassador to Israel
	Mr. Magnus Hellgren, Sweden Ambassador to Israel
	Ms. Penprapa Vongkovit, Thailand Ambassador to Israel
Government Officials	Ambassador Denis Ross and Washington Institute trustees
	Committee for Immigration, Absorption and Diaspora Affairs, Knesset Israel
	Dr. Du Zhanyuan, Vice Minister of Education, People's Republic of China
	Elazar Stern, Knesset Israel
	H.E. Mr. Andrej Kiska, President of the Slovak Republic
	H.E. Mr. Yosuke Tsuruho, Minister of State for Science and Technology Policy, Japan
	H.E. Mrs. Lilia Hrynevych, Ukrainian Minister of Education & Science
	Major General Nadav Padan, IDF, Israel
	Major General Tamir Yadai, IDF, Israel
	Mr. Bruce Rauner, Governor of Illinois, USA
	Mr. Esben Lunde Larsen, Minister of Environment & Food, Denmark
	Mr. Hu Chunhua, The Guangdong Party Secretary, People's Republic of China
	Mr. Rahm Emanuel, Mayor of Chicago, Illinois, USA
	Parliament members, Cordova, Argentina
	Prof. Alexander Bligh, Israeli Ministry of Science, Technology & Space
	Prof. Nkandu Luo, Zambia's Honorable Minister of Higher Education
Vice Mayor of Shenzhen, China	
Industry Visits	Airbus, France
	BMW, Germany
	BNP Paribas, France
	Credit Agricole, France
	Denso, Japan
	Fujitsu, Japan
	Gaprise, Japan
	Hyundai and KAIST, South Korea
	Igal Landau and Amos Horev, Israel
	Mark Weill, USA
	Nichia, Japan
	ORANGE and BNP Paribas CARDIF, France
	Orange, France
	Plastic Omnium, France
	PSA Groupe, France
	Rony Zarom & Unistream





<b>Industry Visits</b>	Samurai/Nissan, Japan-Israel
	Servier, France
	Swiss Re Institute, Switzerland
	Swisscom, Switzerland
	Vinci Energies, France
<b>Other Special Visitors</b>	ATF Mission
	ATS Staff Orientation
	DARPA & MAFAT, USA & Israel
	Negev Nuclear Research Center (NNRC) Council, Israel
	Rabbi Yitzchak Grossman, Israel
<b>Technion Supporters</b>	Adelis Foundation
	Andrew and Aviva Goldenberg
	Baroness Ariane de Rothschild
	Bill Gates Foundation
	Bob & Ruth Magid
	Bob Hanisee & Mark Dorner Mission
	Buddy and Arline Pepp and Family
	Dr. Anja Schuemann
	Dr. Hiroshi Fujiwara
	Dr. Merry Sherman Saifer
	Iurii and Inna Kiperman
	Joseph & Jeanette Neubauer
	Larry Wolfe
	Les Seskin
	Mark and Nina Gaines
	Moises Bacal
	Mark Hamon
	Richard and Michael Amado
	Sir Michael Heller and Lady Morven Heller
	Steve and Ilene Berger
Susan Raymer and Ben Wygodny and Families	
Taub Family	
Theodore Yach	
<b>University Presidents, Administration and Academics</b>	Anahuac University delegation, Mexico
	CERN delegation, Switzerland
	Delegation from Beijing Jiaotong University, Pople's Republic of China
	Delegation from Liberty University, USA
	Delegation of VP Universities, UK
	Hebrew University Delegation, Israel
	Kennesaw State University, USA
	Leiden University Board, The Netherlands
	Michigan State University, USA
	Mordovian State University, Russia
New Jersey University Presidents, USA	



University Presidents, Administration and Academics	Prof. Andersson, President, NTU Singapore
	Presidents and Chancellors from Universities, USA
	Prof. Poppema, President, University of Groningen, The Netherlands
	Prof. Jiang Mianheng, Shanghai Tech University, Pople's Republic of China
	Rectors Delegation, Spain
	Skolkovo delegation, Russia
	Skoltech delegation, Russia
	South Korea University Presidents
	Tecnolgico de Monterrey, Mexico
	The South Ural State University, Russia
	Universidade Positivo of Curitiba Rogerio Mainardes & Giovani Ferreira, Brazil
	University of Rennes, France
	University Presidents, Canada
	University Rectors, Croatia
	University Rectors, Cyprus
Vice Rectors Delegation, Italy	





## Technion Alumni Association

### Technion Alumni Association

The Alumni Association works to strengthen the relationship between Technion and its alumni. We keep the alumni up-to-date on what is going on at Technion and the scientific and technological research achievements.

The Association enables alumni to make use of the professional-social network to renew contacts with other alumni and find professional opportunities.

We launched a new website this year that is compatible with mobile devices. The Association is active on social networks and does its best to reach Technion alumni in Israel and around the world. The association also has a job board on the website.

Special emphasis is placed on nurturing young alumni and networking, by organizing events such as Technion on the Bar, the Technion Café, meetings with members of Club 100 and more.

### Hi-Technion Lecture Series

The Hi-Technion lecture series at the Eretz Israel Museum in Tel Aviv tells alumni about groundbreaking research from Technion's best researchers in a variety of fields.



Fourth annual Alumni Association Lady Tech Conference

## **Club 100**

Club 100 is made up of alumni who have attained key positions in Israeli society, and is planning to help Technion advance its achievements with the Israeli government and the public. The Club is preparing to recruit graduates who have reached senior positions in international companies abroad also. This year, for the first time, the Club held a meeting between Technion's alum donors and entrepreneurs.

## **The Technion Alumni Scholarship Fund**

The fund organizes scholarships for underprivileged and outstanding students.

## **Alumni on Campus program**

Alumni visit their respective faculties and organize roundtable discussions on the future of the profession and career development. Alumni, students and faculty take part in these discussions.

## **Lady Tech conference**

The Association strives to empower women students and alumnae by creating networking opportunities and providing tools for professional development. This year, they held the fourth Lady Tech conference.

## **TenGiving program**

This year was the first year for the program. Each alumnus devotes 10 hours to a student in his or her faculty, who is in the final stages of their studies to help them find employment.



## MadaTech – The Israel National Museum of Science, Technology, and Space

Since 1986, the museum has been housed in Technion's historic campus building on the Hadar in Haifa. The museum was founded in memory of Daniel and Mathilde Recanati, with the assistance of the Recanati family. Leon Recanati serves as Chairman of the Board.

MadaTech's academic committee is headed by Technion Nobel Laureate, Distinguished Prof. Dan Shechtman, and the museum's activities are supported by Technion, the Ministry of Culture and Sport, Ministry of Education, Ministry of Science and Technology and the Municipality of Haifa.

The purpose of MadaTech is to:

- Serve as an innovative science museum and a leading educational center bringing science and technology to the public
- Inspire curiosity and creativity in children and youth, to encourage them to study and explore for the sake of Israel's future as a community and as a society
- Preserve the cultural, scientific, and technological assets of the world in general and of Israel in particular
- Encourage and foster scientific and technological literacy in Israel

### Visitors:

Number of visitors to MadaTech in 2017 was 309,774 (general public and the "Fab Lab"; 187,526, educational activities; 83,248; outdoor marketing activities: 39,000).

### Exhibitions held in 2017:

- Guide to the Galaxy – "A Look to the Heavens" – developed at MadaTech alongside an international exhibition, "Man and Space"
- Exhibition held in memory of Ilan Ramon, the first Israeli astronaut
- Netrix Internet Center in memory of Gershon Lichtman, which combines art and science with digital means, opened in its new format
- RESCUE – an international exhibition with search and rescue demonstrations
- The Israel Planners Association

## Exhibitions Abroad:

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- MadaTech planned a science park, inaugurated in Kiev, Ukraine
- Two science museums were planned and designed for two Ethiopian cities

## Education and training:

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- The Education Division is a center for science, technology, and space studies for grade school students and the general public. The Education Center operates a network of 15 modern and sophisticated laboratories and demonstration halls on various scientific and technological subjects for youth and children. The Education Center has extensive knowledge and experience in implementing programs to reduce social gaps.
- MadaTech, in partnership with the Ministry of Education and Ministry of Science and Technology, runs the “Core Experiences” program at science museums. As part of the 2016-2017 program, MadaTech worked a total of 10,782 students. In the 2017-2018 school year, 680 fifth and seventh grade classes are assigned, and three mobile units going to schools operate daily.
- “Makers” Labs – the Adelis Center for Collaborative Technology in memory of André Cohen Deloro of the Adelis Foundation – reflects a new concept of informal education.
- The Gelfand Robotics Center made the world of robotics accessible to children and allowed them to experience robot assembly and programming.
- Enrichment classes – 11 science and technology classes were developed and implemented, in cooperation with the Ministry of Science and Technology, within the framework of a proposal approved by the Ministry.
- “Makers” groups (24 academic hours per student) for fourth and sixth graders on robotics, DIY for seventh and eighth graders, and digital design for ninth graders.

## Key Community Events:

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- Open days were held for the community in cooperation with the Ministry of Science and Technology.
- September 19, 2017 - “Researchers’ Night,” an annual event sponsored by the European Union in cooperation with the Ministry of Science and Technology.
- Health Literacy Project funded by the Ministry of Economy and Ministry of Social Affairs and Social Services
- Sustainability Research and Problem Solving Fair
- Cooperation with Technion’s Faculty of Education in Science and Technology - A joint education team lead a Technion course on teaching methods in science museums.
- The third scientific conference for high school students from the city of Haifa
- Training ultra-orthodox teachers
- The “Best of Science” project is sponsored by a private foundation and held in cooperation with the Haifa Municipality’s Excellence Department.
- Kindergarten project in cooperation with the Municipality of Haifa
- “Caution Academy,” a dramatized demonstration for the general public that visited the RESCUE exhibition.
- Summer tour groups
- World Space Week – Initiated by the Israel Space Agency
- Autumn and Winter Saturdays – The education team developed seven expos for seven different exhibitions.





## Special Educational Projects:

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- A two-day “Make-a-thon” in cooperation with Intel and the Excellence Department of the Haifa Municipality at the Adelis Center for Cooperative Technological Creation.
- “The Digital World” – 150 children from first through sixth grades participated in weekly summer camps.
- A seminar for students from the Mexican Jewish community.
- A seminar for the international summer camp, Kimama.

## Important Events:

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- Visit by Israeli Minister of Education, Naftali Bennett
- Meeting of Prince Maximilian of Liechtenstein with MadaTech’s chairman.
- Launch of the Public Council on April 4, 2017, with the participation of Technion President Prof. Peretz Lavie.

## Noteworthy events:

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- Events at MadaTech: ArchiParchiTura party (Technion’s Faculty of Architecture and Town Planning); Victory Day (Scouts); Giborei Zion School’s year-end celebration; a cultural evening for the Italian Embassy and Italian Cultural Institute; “Path of Light” event for the Israel Electric Corporation; Ramot Yitzhak School’s graduation event.

## Community Events:

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- **Conferences:** Israel Planners Association, National Service coordinators, Leumi Bank, and the Ironi Daled vocational high school.
- **Outside Activities:** Big Fashion Mall in Tiberias and the Oceanarium in Kfar Saba.

## Infrastructure:

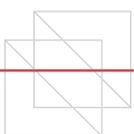
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- Northern Garden – Renovations progressed, including the restoration of the cistern with the support of the Jewish National Fund, the municipality, Technion, and MadaTech. The inauguration took place on March 26, 2018, with the participation of Technion President Prof. Peretz Lavie.

## “Fab Lab” activities during the past year:

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- Various projects with schools
- Gordon College “Makers” course for Early Childhood Education students:
- WIZO Haifa Academy of Design and Education digital production course
- Ariel University’s Faculty of Engineering: MadaTech is guiding the teaching staff
- “Come on, Science” - World ORT seminar.
- RAFAEL Advanced Systems Excellence Make-a-thon
- Personalized fidget spinner workshops
- Shenkar College



- Unique art projects, combined with digital production
- Social activities for community centers
- Jewish Agency for Israel – introduction to and experimentation with digital production
- Technology camp for “Technion Leaders” (on behalf of Philips Medical
- Arduino workshops for seventh to ninth graders
- Advanced APEX spinner workshops
- A sign language course at the “Fab Lab.
- Reali School technical staff training
- Amital School, Petach Tikvah – state-religious education
- Workshop for The Israeli Organization for ADHD on making dreams a reality
- Ta’asiyeda (Industry for Advanced Education
- Phillips training for engineers and Make-a-thon
- FabLearn Conference.
- Leo Baeck Education Center – training young technology leaders
- BrainTECH Make-a-thon at Technion
- Nahariya Municipal Library



Historic Technion Building 1924



## Awards and Honors

### INTERNATIONAL AWARDS AND HONORS

#### AMERICAN SOCIETY OF MECHANICAL ENGINEERS

##### Frank Kreith Energy Award

Prof. Emeritus Gershon Grossman  
Faculty of Mechanical Engineering

#### EUROPEAN MOLECULAR BIOLOGY ORGANIZATION (EMBO)

##### Member

Prof. Roy Kishony  
Faculty of Biology

#### HORIZON 2020: THE EU FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION - EUROPEAN RESEARCH COUNCIL GRANTS (ERC)

##### ERC Consolidator

Assoc. Prof. Yuval Shaked  
Rappaport Faculty of Medicine

Prof. Lior Gepstein  
Rappaport Faculty of Medicine

Assoc. Prof. Gil Alexandrowicz  
Schulich Faculty of Chemistry

##### ERC Starting Grant

Assoc. Prof. Keren Censor-Hillel  
Faculty of Computer Science

Asst. Prof. Shahar Kvatinsky  
Viterbi Faculty of Electrical Engineering

Asst. Prof. Asya Rolls  
Rappaport Faculty of Medicine

Assoc. Prof. Uri Shapira  
Faculty of Mathematics

#### HOWARD HUGHES MEDICAL INSTITUTE (HHMI)

##### International Research Scholar

Asst. Prof. Asya Rolls  
Rappaport Faculty of Medicine

#### INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

##### Fellows

Assoc. Prof. Alex Bronstein  
Faculty of Computer Science

Visiting Prof. Avi Mendelson  
Faculty of Computer Science

Prof. Assaf Shuster  
Faculty of Computer Science

#### INSTITUTE OF INDUSTRIAL AND SYSTEMS ENGINEERING (IISE)

##### Book of the Year Award

Prof. Avraham Shtub  
Davidson Faculty of Industrial Engineering and  
Management

#### INTERNATIONAL ACADEMY FOR THE HISTORY OF PHARMACY

##### Medal

Prof. Efraim Lev  
Department of Humanities and Arts

## **INTERNATIONAL ASSOCIATION OF ADVANCED MATERIALS (IAAM)**

### **Medal**

Prof. Emeritus Avraham Marmor  
Wolfson Faculty of Chemical Engineering

## **INTERNATIONAL ASSOCIATION OF SURVEYORS (FIG)**

### **Honorary Fellowship**

Prof. Emeritus Yerach Doytsher  
Faculty of Civil and Environmental Engineering

## **INTERNATIONAL UNIVERSITY OF CATALONIA**

### **Honorary Doctorate**

Assoc. Prof. Rivka Oxman  
Faculty of Architecture and Town Planning

## **MINISTRY OF EDUCATION OF THE PEOPLE'S REPUBLIC OF CHINA**

### **Changjiang Distinguished Professorship**

Prof. Hossam Haick  
Wolfson Faculty of Chemical Engineering

## **NATIONAL ACADEMY OF CONSTRUCTION**

### **First Honorary Member outside North America**

Prof. Aviad Shapira  
Faculty of Civil and Environmental Engineering

## **SOCIETY FOR EXPERIMENTAL MECHANICS (SEM)**

### **Lazan Award**

Prof. Daniel Rittel  
Faculty of Mechanical Engineering

## **TECHNICAL UNIVERSITY OF MUNICH**

### **Honorary Doctorate**

Prof. Orna Grumberg  
Faculty of Computer Science

## **UNIVERSITY OF FLORIDA**

### **Distinguished Alumnus Award**

Technion President  
Prof. Peretz Lavie

## **WEB OF SCIENCE**

### **Highly Cited Researchers**

Prof. Michael Elad  
Faculty of Computer Science  
Prof. Basil Lewis  
Rappaport Faculty of Medicine  
Prof. Shlomo Shamai (Shitz)  
Viterbi Faculty of Electrical Engineering

## **ISRAELI AWARDS AND HONORS**

### **AIR FORCE MUSEUM IN HATZERIM**

#### **Competition Winner**

Assoc. Prof. Gaby Schwartz  
Faculty of Architecture and Town Planning

### **BLAVATNIK AWARD FOR YOUNG SCIENTISTS IN ISRAEL**

Asst. Prof. Charles E. Diesendruck  
Schulich Faculty of Chemistry  
Assoc. Prof. Anat Levin  
Viterbi Faculty of Electrical Engineering

### **COUNCIL FOR HIGHER EDUCATION**

#### **Allon Fellows**

Asst. Prof. Nadav Amdursky  
Schulich Faculty of Chemistry  
Asst. Prof. Naama Geva-Zatorsky  
Rappaport Faculty of Medicine  
Asst. Prof. Elad Koren  
Faculty of Materials Science and Engineering  
Asst. Prof. Kinneret Tedorescu  
Davidson Faculty of Industrial Engineering and Management

### **EMET PRIZE FOR 2017**

#### **For Computer and Electronic Engineering**

Dist. Prof. Emeritus Jacob Ziv  
Viterbi Faculty of Electrical Engineering

### **ISRAEL CHEMICAL ENGINEERING ASSOCIATION**

#### **Honorary Fellow**





Prof. Yachin Cohen  
Wolfson Faculty of Chemical Engineering

#### **ISRAEL CHEMICAL SOCIETY**

##### **Gold Medal Award**

Dist. Prof. Yitzhak Apeloig  
Schulich Faculty of Chemistry

#### **THE ISRAELI ACADEMY OF SCIENCES AND HUMANITIES**

##### **Elected Member**

Prof. Yonina Eldar  
Viterbi Faculty of Electrical Engineering

#### **THE ISRAEL YOUNG ACADEMY OF SCIENCE**

##### **Elected Member**

Assoc. Prof. Eran Yahav  
Faculty of Computer Science

#### **UNIVERSITY OF HAIFA**

##### **Honorary Doctorate**

Prof. Hossam Haick  
Wolfson Faculty of Chemical Engineering

#### **THE MARKER**

##### **40 Most Promising under 40 in Israel**

Assoc. Prof. Keren Censor-Hillel  
Faculty of Computer Science

#### **MINISTRY OF CULTURE AND SPORT**

##### **Arik Einstein Prize for Culture and Arts in the Field of Artistic Music**

Assoc. Prof. Dalia Atlas (ret.)  
Department of Humanities and Arts

##### **Prize in the Field of Plastic Arts**

Dr. David Behar-Perahia  
Faculty of Architecture and Town Planning

#### **NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING**

##### **Elected President**

Prof. Tali Tal  
Faculty of Education in Science and Technology

#### **BRUCE AND RUTH RAPPAPORT FOUNDATION**

##### **Rappaport Prize for Excellence in the field of Biomedical Research**

Prof. Shulamit Levenberg  
Faculty of Biomedical Engineering

#### **WOLF FOUNDATION**

##### **2018 Krill Prize for Excellence in Scientific Research**

Asst. Prof. Meytal Landau  
Faculty of Biology

Asst. Prof. Charles E. Diesendruck  
Schulich Faculty of Chemistry

Asst. Prof. Yakov Babichenko  
Davidson Faculty of Industrial Engineering and Management

#### **YAD HANADIV (ROTHSCHILD FOUNDATION)**

##### **Michael Bruno Memorial Award**

Prof. Ashraf Brik  
Schulich Faculty of Chemistry

#### **TECHNION AWARDS AND CHAIRS**

##### **DAVID DUDI BEN-AHARON RESEARCH PRIZE**

Assoc. Prof. Mark Gandelman  
Schulich Faculty of Chemistry

##### **COOPER AWARD FOR EXCELLENCE IN RESEARCH**

Assoc. Prof. Anat Levin  
Viterbi Faculty of Electrical Engineering

##### **ALEXANDER GOLDBERG RESEARCH PRIZE**

Asst. Prof. Barak Fishbain  
Faculty of Civil and Environmental Engineering

##### **HENRI GUTWIRTH FOUNDATION RESEARCH GRANTS**

Asst. Prof. Guy Ramon  
Faculty of Civil and Environmental Engineering

Asst. Prof. Meytal Landau  
Faculty of Biology

Dr. Oksana Stalnov  
Faculty of Aerospace Engineering



**UZI AND MICHAL HALEVY INNOVATIVE APPLIED ENGINEERING AWARD AND RESEARCH GRANTS**

Prof. Yair Ein-Eli  
Faculty of Materials Science and Engineering  
Assoc. Prof. Alon Wolf  
Faculty of Mechanical Engineering  
Asst. Prof. Igal Kronhaus  
Faculty of Aerospace Engineering

**JULUDAN RESEARCH PRIZE**

Asst. Prof. Shelly Tzlil  
Faculty of Mechanical Engineering

**RAYMOND AND MIRIAM KLEIN RESEARCH PRIZE**

Assoc. Prof. Elon Rimon  
Faculty of Mechanical Engineering

**HILDA AND HERSHEL RICH TECHNION INNOVATION AWARDS**

Asst. Prof. Yuval Cassuto and Rami Cohen  
Viterbi Faculty of Electrical Engineering  
Assoc. Prof. Mark Gandelman,  
Dr. Gennady Nisnevich and  
Alexander Artaryan  
Schulich Faculty of Chemistry  
Asst. Prof. Shahar Kvatinsky and Danial Loai  
Viterbi Faculty of Electrical Engineering  
Assoc. Prof. Josue Sznitman and Yan Ostrovski  
Faculty of Biomedical Engineering  
Prof. Daniel Rittel and Assoc. Prof. Nitai Drimer  
Faculty of Mechanical Engineering  
Prof. Michael S. Silverstein and  
Sebastijan Kovacic  
Faculty of Materials Science and Engineering

**NORMAN SEIDEN PRIZE FOR ACADEMIC EXCELLENCE**

Prof. Israel Cohen  
Vitterbi Faculty of Electrical Engineering

**DIANE SHERMAN PRIZE FOR MEDICAL INNOVATIONS FOR A BETTER WORLD**

Prof. Amit Meller  
Faculty of Biomedical Engineering

**HENRY TAUB PRIZE FOR ACADEMIC EXCELLENCE**

Prof. Ashraf Brik  
Schulich Faculty of Chemistry  
Assoc. Prof. Avner Rothschild  
Faculty of Materials Science and Engineering  
Prof. Michael S. Silverstein  
Faculty of Materials Science and Engineering  
Assoc. Prof. Jeff Steinhauer  
Faculty of Physics

**MOSHE YANAI AWARDS FOR EXCELLENCE IN EDUCATION**

**Faculty Prize: Civil and Environmental Engineering**

Assoc. Prof. Gil Alexandrowicz  
Schulich Faculty of Chemistry  
Asst. Prof. Ram Band  
Faculty of Mathematics  
Prof. Michael Elad  
Faculty of Computer Science  
Asst. Prof. Mahmood Jabareen  
Faculty of Civil and Environmental Engineering  
Assoc. Prof. Josue Sznitman  
Faculty of Biomedical Engineering

**Teaching Initiative Grant:**

Assoc. Prof. Yossi Gil  
Faculty of Computer Science

**Honorable Mention:**

Asst. Prof. Omri Barak  
Rappaport Faculty of Medicine

**LEADERS IN SCIENCE AND TECHNOLOGY and CAREER ADVANCEMENT CHAIRS**

**Career Advancement Chair at Technion**

Asst. Prof. Kinneret Teodorescu  
Davidson Faculty of Industrial Engineering and Management

**Career Advancement Chair in Economics and Finance**

Asst. Prof. Yakov Babichenko  
Davidson Faculty of Industrial Engineering and Management





**Leona Chanin Career Development Chair**

Asst. Prof. Lior Kornblum  
Viterbi Faculty of Electrical Engineering

**HOREV FELLOWS**

Asst. Prof. Naama Geva-Zatorsky  
Rappaport Faculty of Medicine

Asst. Prof. Graham de Ruiter  
Schulich Faculty of Chemistry

**Jacques Lewiner Career Advancement Chair**

Asst. Prof. Ido Kaminer  
Viterbi Faculty of Electrical Engineering

**David and Inez Myers Career Advancement Chair in Life Science - Lee Kohrman**

Dr. Haguy Wolfenson  
Rappaport Faculty of Medicine

**Robert J. Shillman Career Advancement Chair**

Asst. Prof. Shay Hacohen-Gourgy  
Faculty of Physics

**TAUB FELLOWS**

Asst. Prof. Elad Koren  
Faculty of Materials Science and Engineering

Asst. Prof. Daniel Soudry  
Viterbi Faculty of Electrical Engineering

**NEW CHAIR INCUMBENTS**

**Bertha Axel (nee Hertz) Chair in Chemistry**

Prof. Noam Adir  
Schulich Faculty of Chemistry

**Otto Barth Family Chair in Biomedical Sciences**

Prof. Elon Eisenberg  
Rappaport Faculty of Medicine

**Martin and Sima Jelin Chair in Mathematics**

Prof. Amos Nevo  
Faculty of Mathematics

**Shlomo Kaplansky Academic Chair**

Prof. Mordechai (Motti) Choder  
Rappaport Faculty of Medicine

**Millstone/St. Louis Chair in Civil/Environmental Engineering**

Prof. Yehuda Agnon  
Faculty of Civil and Environmental Engineering

**Eric and Sheila Samson Chair in Physics**

Prof. Oren Bergman  
Faculty of Physics

**Skillman Chair in Biomedical Sciences**

Prof. Ron Meir  
Viterbi Faculty of Electrical Engineering

**Abraham Tulin Academic Chair**

Prof. Yuval Ishai  
Faculty of Computer Science

**Roy Matas Winnipeg Chair in Biomedical Engineering**

Prof. Amit Meller  
Faculty of Biomedical Engineering

**Lord Leonard Wolfson Academic Chair**

Prof. Idit Keidar  
Viterbi Faculty of Electrical Engineering

