



AMERICAN  
**TECHNION**  
SOCIETY

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# Powering **ISRAEL.** Changing the **WORLD.**

*Technion Viewbook*





# THE TECHNION

Since 1924, the Technion - Israel Institute of Technology has been home to dreamers, inventors, and innovators who think about the world's problems differently. Within classrooms and laboratories, Technion students and faculty are encouraged to explore their passions, to reach beyond the confines of their disciplines, and to pursue the unconventional. Alumni carry that pioneering spirit to some of the highest positions within the Israeli government and multinational corporations around the world.

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This publication was generously supported by Eric and Loren Stein of Boca Raton, FL.

# At the Technion, we specialize in the IMPOSSIBLE.

As I sat down to write this message, I took time to reflect upon the ways the pandemic and other global events have upended the world we once knew. When I took office in October 2019, I could not have imagined the changes ahead, but the Technion has coped well with them. Moreover, by addressing these unexpected challenges, and seizing the new opportunities opened by the pandemic, we are stronger, more agile, and better adapted today than we were two years ago.

As the Technion approaches its centennial year in 2024, I take great pride in all we have accomplished so far, in how the Technion continually rises to address the world's most demanding challenges, and fulfills its mission to help shape and protect the State of Israel. There is, in fact, no other university whose commitment to its country plays such a central role in its mission. Throughout its storied history, the Technion — with its culture of cooperation, inventiveness, and perseverance — has helped bring water to the desert, identify promising potential cures for cancer and neurodegenerative diseases, develop technology to propel the Israeli economy, and provide the backbone for Israel's security.

Today, we face tests of readiness leading to the 22nd century: the decentralization of knowledge, the encroachment of industry into spaces that were once the sole province of academia, and, of course, the many challenges facing Israel and our planet.

I assure you the Technion is ready to tackle these challenges. We are investing in the infrastructure needed to compete in the global marketplace, including opening the new interdisciplinary Technion Human Health Initiative, the new research front in sustainability, and the Technion Center for Smart Industry, a cutting-edge center that will push Technion research and the Israeli economy to new heights. Technion faculty and students continue to pursue bold projects in diverse fields from space to quantum science, from architecture to human health.

With its culture of curiosity and optimism, informal networks through which innovation flows, the freedom to explore novel concepts, and an amalgam of brilliant minds, the Technion continues to be perfectly poised to address the world's greatest challenges.

That we can address them by taking risks, making bold investments, and advancing our strategic priorities even in tumultuous times is thanks to the American Technion Society community. Your belief in the Technion is critical to our success. Thank you for your support, and for your partnership as we fulfill our shared mission to build Israel's economy, secure its land and people, and contribute ideas and innovations that benefit humankind.

Prof. Uri Sivan, Technion President

## Letter From ATS Leadership

**L**ook into any classroom or research facility at the Technion and you'll see something special: collaboration. Whether it is working across countries and continents, uniting seemingly disparate disciplines toward a common goal, or establishing relationships with rival universities and major industries, collaboration is a crucial part of the Technion's DNA.

This collaborative spirit grew a tiny university in Haifa into a globally ranked innovation superpower, one that has built Israel from the ground up and underpins its economy. The Technion has prepared, shaped, and empowered the high-tech nation that Israel is today — and as you'll read in the coming pages, Technion collaboration and innovation will ensure that Israel remains a force to be reckoned with around the world.

This work is possible because of another collaboration: that between the Technion and the American Technion Society. Since 1940, the ATS community has raised close to \$3 billion in support of scholarships, research, labs, and state-of-the-art facilities. We champion Technion people, ideas, and innovations because we know when the Technion is strong, Israel is strong.

Today, ATS plays a pivotal role in realizing the Technion's remarkable vision of multidisciplinary research that cuts across traditional boundaries to tackle the grand challenges of the 21st century. We are already seeing this vision come to life at the Rappaport Technion Integrated Cancer Center, the Nancy and Stephen Grand Technion Energy



Michael Waxman-Lenz (l) and Steve Berger (r)

Program, and the Stephen and Nancy Grand Water Research Institute. It's led to remarkable new companies like H2Pro. And we see it in the remarkable Technion people — current and former students like Neta Blum '14, M.S. '18, Ph.D. '22, and Dr. Yehuda Sabiner '16, MD '19, and faculty members like Prof. Roy Kishony, Prof. Daniella Raveh '92, Ph.D. '99, and Prof. Marcelle Machluf.

We remain incredibly proud to play a part in this extraordinary institution that has given so much to the State of Israel and the world — and we invite you to join us.

Steve Berger, President

Michael Waxman-Lenz, CEO



# A HISTORY LIKE NO OTHER



Top / The original Technion in Haifa, in use until the mid-1980s. The building is now home to MadaTech, Israel's National Museum of Science, Technology, and Space.

Bottom / Construction of the Technion, 1912

In 1909, architect Alexander Baerwald developed plans for a new kind of institution: a world-class scientific and research institution for the Jewish people. Haifa, Israel — a busy port city in the shadow of Mount Carmel — was chosen as the site for the ambitious new university.

At the time, Jews were being persecuted across Europe and Russia. They were barred from technical and scientific training — the very knowledge needed to build a Jewish state. This new university would be different.

Despite challenges and setbacks, in 1912 the cornerstone of the future Technion — Israel Institute of Technology was laid. Envisioned as a university around the dream of a Jewish homeland, the Technion's founders wanted the university to fulfill the Zionist vision of "a light unto the nations" through its academic and scientific contributions to the world. Yet even the founders could not have imagined the kind of impact the university would have on Israel, scientific research, and humankind.

Albert Einstein visited the Technion in 1923, planting a palm tree that still stands next to the original campus today. Long a supporter of the State of Israel, Einstein established in Germany the first Technion Society and was instrumental in raising funds for the Technion.

The Technion opened its doors for the first time in 1924, a year after Einstein's visit. The Technion's inaugural class had 17 students, including one woman.

The 1940s were a turning point for the Technion. Jewish students and distinguished scholars fleeing the Nazi regime in Europe came to the Technion for refuge. The dream of an independent State of Israel was at the forefront of everyone's minds.

The Technion played a pivotal role in preparing the State of Israel to declare independence and establish itself as a young nation. It was Technion engineers who built Israel's roads and infrastructure, and helped green the desert so Israel could make use of its scarce natural resources. At every juncture in Israel's development, the Technion was there — shaping, supporting, and protecting the State of Israel.

To meet the demands of a growing and diverse student body and young country, the Technion established the Faculty of Electrical Engineering, the Faculty of Mechanical Engineering, and the Department of Aeronautical Engineering, the latter a directive of Prime Minister David Ben-Gurion himself, who recognized the need for Israel to develop an independent defense infrastructure.



Prof. Albert Einstein (center), founder of the first Technion Society, at the original Technion building



Hero of Israel and former Chairman of Rafael, Maj. Gen. (Res.) Amos Horev (second from left) served as president of the Technion from 1973–1982

The 1960s saw the transformation of the Technion from an institution benefiting the State of Israel to one that was transforming the world. The Technion's vision as "a light unto the nations" became real through discoveries in human health, technology, agriculture, water, energy, medicine, and much more. The Technion partnered with United Nations agencies to apply their creative, innovative solutions to some of the world's most intractable challenges.

Since first opening its doors in 1924, the Technion has continually pushed the boundaries of what academic research looks like. In 2018, it opened the Helen Diller Quantum Center, the first of its kind in Israel. Research at the Helen Diller Center focuses on quantum computing and information processing, quantum communications, quantum sensing and detection, quantum simulations, quantum simulators, and quantum materials.

The facility also serves as a collaboration hub between Technion scientists, researchers, and engineers from the faculties of electrical engineering, physics, chemistry, materials science engineering, mechanical engineering, and computer science. Such interdisciplinary collaborations are a hallmark of the Technion and have led to unprecedented innovations in a variety of fields.

The Technion's reputation of excellence, creativity, and ingenuity earned it partnerships with other globally ranked universities like MIT, Carnegie Mellon University, Cornell University, and University of Michigan, as well as dozens of research grants from the European Union. In 2011, the Technion and Cornell partnered to win New York City's international competition to create an applied sciences graduate school, beating out bids from other prestigious U.S. and international universities. The Joan & Irwin Jacobs Technion-Cornell Institute on Cornell Tech's Roosevelt Island campus in New York City represents an applied technology-based curriculum to help power the future economies of the U.S. and Israel.

Unlike traditional academic departments, the Jacobs Technion-Cornell Institute is centered around three



Dan Shechtman receiving his Nobel Prize at the Stockholm Concert Hall, December 10, 2011

multidisciplinary hubs designed to spur new technologies in connective media, health tech, and urban tech. Students receive dual degrees: one from Cornell and one from the Technion, making the Technion the first international university to grant an accredited degree for studies on U.S. soil.

The Jacobs Technion-Cornell Institute is transforming industry in New York City and around the world through technological innovation, deep-tech startups, and uniquely skilled talent. The Institute is home to the Runway Startup Postdoc Program, providing a pathway for Ph.D.s to become CEOs. As of 2021, Runway has launched 30 startups attracting more than \$100 million from private investment companies.

Halfway around the world, the Technion entered into a historic partnership with Shantou University to create the Guangdong Technion-Israel Institute of Technology (GTIIT) in 2015. GTIIT is the first Israeli university in China, an example of the Technion's growing global influence.

Inaugurated in December 2017, GTIIT represents a new era of cooperative research between Israel and China, focusing on the three interconnected areas of environmental sciences, energy resources, and human health. Bridging East and West, GTIIT is a nexus of international collaboration and development, educating more than 5,000 students through the lens of Israel's innovative and entrepreneurial spirit.

From Haifa to New York City to Guangdong, Technion ingenuity is bringing water to the desert, creating sustainable crops, treating diseases and bettering our health, keeping us safe at home and in cyberspace, and so much more. Not a day goes by when Technion researchers aren't thinking about how to make Israel — and our world — better, safer, healthier, and more secure.



The Jacobs Technion-Cornell Institute in New York City



Joan and Irwin Jacobs on the Cornell Tech campus on Roosevelt Island in New York City



The Guangdong Technion-Israel Institute of Technology in China

# PROTECTING ISRAEL

The Technion is home to Israel's only Faculty of Aerospace Engineering

By the early 1950s, it was clear that Israel's safety and security required an investment in aeronautical research. The State of Israel looked to the Technion for leadership, and in 1954, the Technion established the Department of Aeronautical Engineering. Known today as the Stephen B. Klein Faculty of Aerospace Engineering, it remains Israel's only academic faculty dedicated to research and education in aerospace sciences.

The department was enthusiastically championed by Prime Minister David Ben-Gurion and the Ministry of Defense. In true Technion fashion, the Faculty prioritized delivering solutions to protect Israel's security while also demanding academic excellence, with a curriculum as rigorous as those at top U.S. and European institutions.

The Faculty grew rapidly, owing to its reputation for excellence and high standards. Engineers trained at the Technion established Israel's aerospace industry and continue to lead Rafael, Israel Aerospace Industries (IAI), and Elbit Systems to develop missile guidance systems and other advanced defensive technologies to safeguard the State of Israel.

The Faculty helped Israel join the elite club of space-launch-capable countries in 1988 with the launch of Ofeq 1, Israel's first satellite. Shortly thereafter, the multidisciplinary Norman and Helen Asher Space Research Institute (ASRI) was established to study rocket electric propulsion, spacecraft-formation flight, nanosatellite technologies, and space-plasma technologies. This research has become an integral part of Israel's space industry activities. More recently, the Technion launched the Adelis-SAMSON project, three autonomous nanosatellites that fly in formation in space using autonomous communication, without needing guidance from the ground. The cluster of satellites is used to monitor the location of people, planes, and ships.

"Israel is a world leader in space technology, both in low-Earth orbit (LEO) launch capability and in mini satellite systems. Israel is using its assets in military and civilian areas, and as the only institute in Israel with an aerospace faculty, the Technion plays an important role in educating the scientists and engineers to build those technologies."

— Visiting Professor Brigadier General (Res.) Jacob Nagel, former head of Israel's National Security Council

The Technion is **one of the few universities in the world** that has built and launched a satellite.

Faculty and graduates have helped establish Israel's missile guidance programs, including the vaunted Iron Dome that has prevented nearly 90% of missiles aimed at civilian areas in Israel from hitting their target. Described by *Time* magazine as "the most-effective, most-tested missile shield the world has ever seen," the highly successful system was conceived by Rafael Advanced Defense Systems, whose engineering department is primarily comprised of Technion graduates.



The Faculty remains a point of pride and a national priority for Israel, contributing to the country's long-term security and economic livelihood. More than 2,500 students have graduated from the world-ranked program. Technion professors have been selected to serve in senior leadership roles in IAI, Israeli parliament, and as commanders of the Israel Air Force. A member of the Faculty has even served as Minister of Defense.

Technion faculty and graduates form the backbone of Israel's aerospace boom, with aerospace and related industries contributing at least \$10 billion to Israel's GDP. The Israeli aerospace industry currently employs around 100,000 people — about 3% of the nation's workforce. Israel's aerospace industry influences commercial and aircraft manufacturing, UAVs, satellites, missiles and missile defense, and flight simulators; it also indirectly influences the advanced materials and alternative fuel industries, as well as safety systems, air

traffic management, and digitization and 3D printing of components. Israel's international industry partners include GE, Boeing, Northrop Grumman, Lockheed Martin, Raytheon Technologies, NASA, and the U.S. Department of Defense.

As the field of aerospace engineering evolves, so too must the Technion. The rise of autonomous aviation, microsatellites and nanosatellites, hypersonic propulsion systems, underwater vehicles, and renewable energy provide tremendous opportunities for a safer, more prosperous Israel. The Faculty is in the midst of an extensive revitalization program to meet the challenge, hiring additional staff, offering more support to graduate researchers, and building and modernizing its infrastructure. The expanded staff, resources, and facilities will not only propel the Faculty to an elite position worldwide, but also secure Israel's place at the vanguard of aerospace engineering and innovation.

# BLAZING A TRAIL TO ISRAEL'S FUTURE

The Faculty of Computer Science's bold plans for the next generation of innovation

For more than 50 years, the Henry and Marilyn Taub Faculty of Computer Science has been devoted to making bold, audacious ideas a reality.

It was in the Taub Faculty of Computer Science that Profs. Jacob Ziv and Abraham Lempel devised the Lempel-Ziv algorithm, the basis for GIFs and ZIP compression technologies we rely upon today. In 2021, Prof. Ziv received one of science's most prestigious awards, the Institute of Electrical and Electronics Engineers (IEEE) Medal of Honor, in recognition of this and other impressive contributions to the field of computer science. He is the first Israeli to receive this honor.

And the Taub Faculty of Computer Science is where trailblazer and visiting Prof. Kira Radinsky '08, Ph.D. '12, whose ability to find patterns in data has transformed everything from online retail to preventing disease outbreaks around the world, first got her start. Radinsky was named one of *MIT Technology Review's* "35 Young Innovators Under 35" and one of *Forbes'* "30 Under 30" rising stars in enterprise technology for her accomplishments.

Today, the Taub Faculty of Computer Science — the largest faculty of computer science in Israel — is thriving. The faculty boasts more than 50 members of international acclaim in a variety of fields. In the past four years, there has been a 50% increase in the number of undergraduate degrees in computer science and a 90% increase in graduates with advanced degrees. It's become the second-largest academic department on campus.

The Faculty's impact can be felt beyond the Technion's walls. It's also driving Israel's high-tech industry and accelerating the Israeli economy. Technion alumni and students are integral to Intel's R&D center, home of the Intel Pentium processor and Intel Centrino mobile technology. The innovations produced by faculty and students alike have been instrumental in earning Israel the moniker "Start-up Nation."

"We have built an amazing place here during the past 50 years," said Faculty Dean Prof. Dan Geiger. "This faculty is the backbone of the Israeli high-tech industry and its graduates serve in key positions in the Israeli economy. Computer science is an area that is increasingly



The Technion Faculty of Computer Science's annual "Best Project Contest," June 2021



concerned with all aspects of life. It is a science that provides challenges and delivers successes at a dizzying pace in artificial intelligence, machine learning, and cybersecurity. At the Technion, we are constantly looking for new ways to organize data, use it in creative ways, and protect it."

Yet, analysts worry that Israel may find itself lagging behind other emerging countries due to a shortage of trained leaders in the rapidly growing high-tech sector — particularly in the AI, big data, and quantum computing fields. To maintain Israel's prominence as a tech superpower, Israel's Council for Higher Education has directed universities to rapidly scale up their computer science expertise and expand their student body. Without this substantial growth, Israel's status as a high-tech power — and with it, its ability to compete globally — is at risk.

This threat is personal to the Technion. Perhaps no other university's success is so tightly bound to Israel's survival. In response to the growing challenges, the Technion is embarking on a 10-year expansion plan for the Faculty of Computer Science that was first launched with a transformative gift from the Henry and Marilyn Taub Foundation.

The expansion begins with the construction of a 75,000-square-foot building adjacent to the Henry and Marilyn Taub and Family Science and Technology Center. The new building will house classrooms, seminar and meeting rooms, auditoriums, laboratories, faculty and researcher offices, study rooms, and underground parking. These state-of-the-art facilities will attract and retain some of the world's leading experts and allow faculty members to expand research activities in established and emerging fields. The new facility is expected to open in 2024.

The Technion also plans to expand the student body to 280 full-time graduate students and 2,000 undergraduate students. To ensure the student-to-faculty ratio remains competitive with leading U.S. universities, the Technion will also hire 11 new faculty members. These new students and faculty members will enhance the Technion's research prowess in rising fields including geometrical image processing, robotics, virtual reality, cybersecurity, and artificial intelligence.

For more than 50 years, Technion computer science graduates and faculty members have powered Israel's tech industry. Their achievements have earned the Taub Faculty of Computer Science a coveted spot in the global rankings. As Israel looks forward to the next 50 years, it will continue to depend on the Technion's support and expertise to maintain its advantage in computer science engineering and deliver invaluable innovations to the world.

"My father, Henry Taub, began 'investing' in the Technion over 50 years ago because he believed Israel's greatest asset was its people. That is why my family and I are proud to continue our support today."

— Ira Taub

The Faculty of Computer Science has become the **second-largest academic department** on campus.

# MULTI-DISCIPLINARY RESEARCH HUBS

The Technion is breaking down traditional boundaries between disciplines by establishing a network of multidisciplinary research centers focused on the grand challenges of the 21st century: **human health, sustainability, energy, and smart industry**



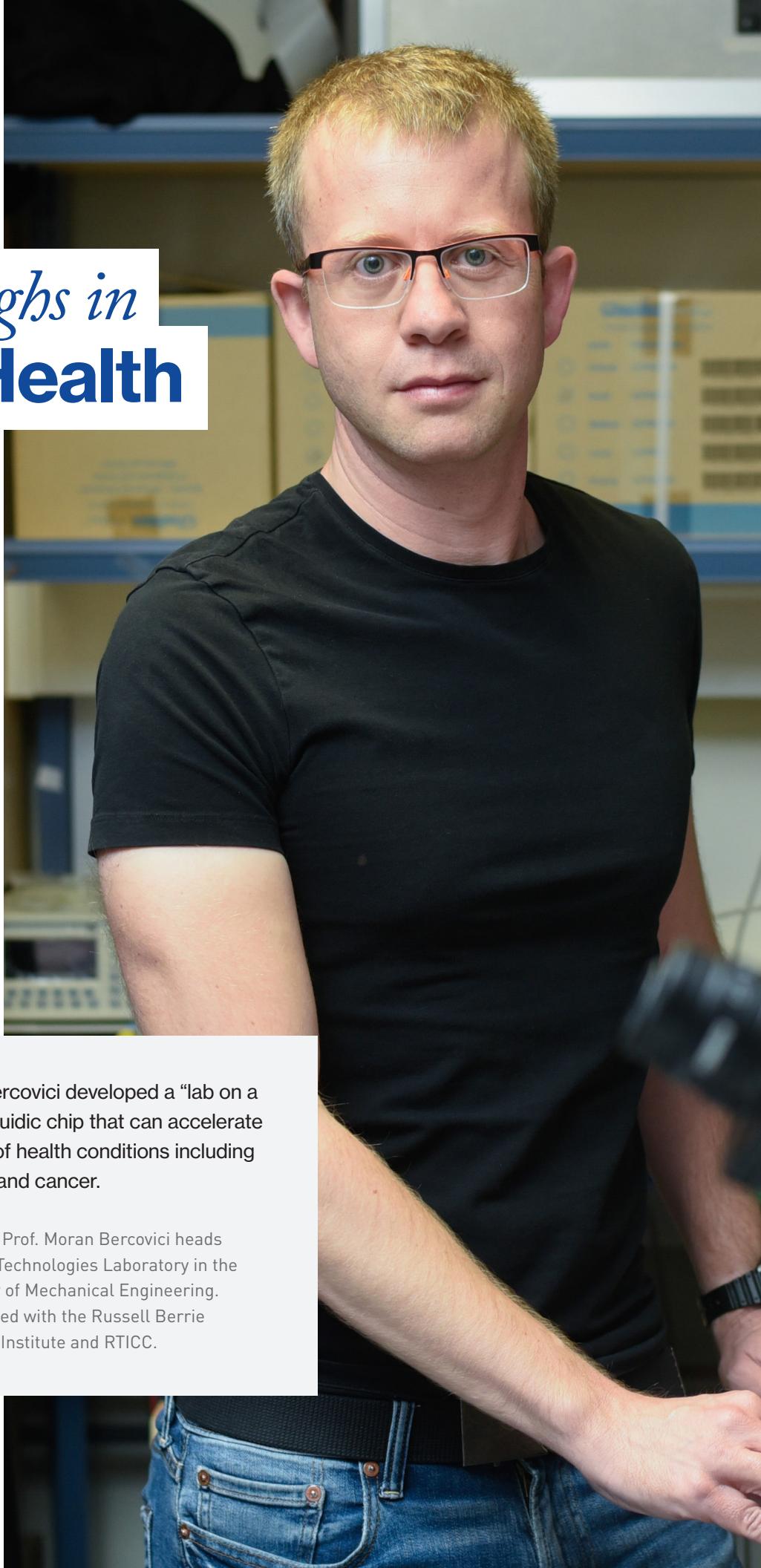
## » Breakthroughs in Human Health

“Traditionally, science is divided into different areas. But what's amazing today is the fact that the boundaries are blurring and all these fields are integrating. Through this cross-pollination between fields, it's possible to achieve things that couldn't be achieved by any field individually.”

- Prof. Moran Bercovici

Prof. Moran Bercovici developed a “lab on a chip,” a microfluidic chip that can accelerate the detection of health conditions including heart disease and cancer.

Pictured Above / Prof. Moran Bercovici heads the Microfluidic Technologies Laboratory in the Technion Faculty of Mechanical Engineering. He is also affiliated with the Russell Berrie Nanotechnology Institute and RTICC.



Like generations of Israelis, the Technion is indefatigable in confronting challenges, choosing to forge unconventional or untested paths in the pursuit of answers. This is especially true of the Technion, one of the only science and engineering universities in the world (and the only one in Israel) with its own faculty of medicine. At the Ruth and Bruce Rappaport Faculty of Medicine, a willingness to think creatively has distinguished it among its peers around the world.

To build on these strengths, the Technion is focusing its recruitment strategy on professors who work across multiple disciplines. This new strategy is paying off, as the world's leading experts in medicine, machine learning, nanotechnology, and oncology have flocked to the Technion because they crave the opportunity to approach problems differently.

Working collaboratively, faculty members interweave medicine with science, technology, and engineering across six pillars of focus: cancer, brain disease, cardiology, genetic syndromes, aging, and trauma. Faculty members' unique expertise and insight, coupled with the Technion's state-of-the-art infrastructure, are leading to intelligent drugs, personalized treatment plans, ingenious medical robots, and more. Over 100 research groups at the Rappaport Faculty of Medicine are developing new insights every day, which move from the lab to commercialization to the bedside quickly thanks to the Technion's relationships with government, industry, and health systems.

The results speak for themselves: The Technion has a proud history of medical innovations ranging from breakthrough drugs such as Azilect for Parkinson's disease, the Nobel-winning discovery of the ubiquitin system that continues to inform new cancer treatments, and technologies such as Novocure that use electrical fields to kill tumors.

### Advancing the Future of Cancer Care

At the Rappaport Technion Integrated Cancer Center (RTICC), world-class clinical experts and Nobel Prize-winning science researchers, chemists, physicists, and engineers collaborate to revolutionize how we diagnose, fight, and one day cure cancer. In recent breakthroughs, Technion researchers have discovered how to diagnose cancer in under two hours, prevent resistance to cancer therapy drugs, and attack tumors from the inside.

The first-of-its-kind institution in Israel is comprised of the Technion's five affiliated hospitals that run clinical trials, the Rappaport Faculty of Medicine's life sciences researchers, the Taub Faculty of Computer Science, the Viterbi Faculty of Electrical and Computer Engineering, the Faculty of Physics, and the Faculty of Mathematics. By bringing together the best of the best inside and outside the medical field, RTICC takes a truly holistic approach to cancer research and patient care.

### Unraveling the Mysteries of the Brain and Aging

The brain is the most critical organ in the body. Yet for centuries, its mysteries eluded researchers, until the Technion pioneered the use of nanotechnology to unlock its inner workings.

Today at the Technion's Allen and Jewel Prince Center for Neurodegenerative Disorders of the Brain, 12 principal investigators are studying the neurodegeneration of the brain, enriching our knowledge of Alzheimer's, Parkinson's, ALS, and Huntington's diseases. For instance, Professor Simone Engelender, along with faculty at Harvard Medical School, is developing model “mini-brains” from Parkinson's and Alzheimer's patients' stem cells that can mimic these diseases. Prof. Engelender's research suggests that, contrary to

popular belief, Parkinson's disease does not start in the periphery and migrate to the brain. Instead, Prof. Engelender believes Parkinson's is caused by simultaneous, widespread death of nerve cells in the brain and central nervous system.

Such advancements are everyday occurrences at the Prince Center because of a culture of collaboration. Like other areas of the Technion, the Prince Center hires faculty who are comfortable in interdisciplinary environments, and actively encourages cross-fertilization of ideas among research groups. By blurring the lines between disciplines, the Prince Center is pushing back the frontiers of brain science, to the benefit of patients, their families, and the global society.

### Combatting Future Pandemics

By bringing together experts from across disciplines, the Technion is able to tackle challenges faster, meaning more breakthroughs and more lives saved. That ingenuity was on display as COVID-19 upended our world and threatened the lives of millions. Faculty and investigators immediately pivoted their work to focus on fighting COVID-19. They worked to develop advanced diagnostic techniques, personalized medical treatment, innovations to keep frontline workers safe, and potential vaccines. Their efforts have become a model for how to quickly and effectively respond to a global health crisis.

### Technion Human Health Initiative

Advancing the standard of health care in the 21st century will require the same multidisciplinary efforts that have led to Technion breakthroughs in oncology, neurological diseases, and COVID-19. The Technion Human Health Initiative (THHI) brings together physicians from Rambam Health Center in Haifa, Technion faculty members, and industry partners in the pharmaceutical and biomedical sectors under one roof.

"The future of research, and I believe the future of Israel, too, is in researching the brain."

— President Shimon Peres z"l

Many leading universities have recognized the importance of multidisciplinary research and have responded by establishing their own multidisciplinary research centers. But it is not enough to simply build facilities. The Technion Human Health Initiative is unique in its focus on sparking the interest, commitment, and engagement of investigators, teachers, and students from across disciplines.

For students, that means an educational experience like none other. At THHI, traditional academic fields, cutting-edge technologies, and medical conditions are woven into a tight tapestry, fusing medicine, science, and engineering. The result is an education grounded in real-world experiences, inspiring leadership, and initiative-taking before students even graduate. For faculty members, a position at THHI means the opportunity to closely collaborate with some of the most imaginative and accomplished faculty in the world, in a rich, well-resourced environment where such partnerships are celebrated.

Medical and pharmaceutical companies, seeing the value of cross-discipline that THHI offers, are lining up to partner with the students and researchers at THHI. Industry-funded projects, public-private partnerships, and a dedicated startup incubator for entrepreneurs provide additional outlets for the tremendous talent and ingenuity on campus.



NaorCov19, developed by Prof. Naama Geva-Zatorsky, rapidly diagnoses the SARS-CoV-2 virus from a saliva sample. The test takes about 40 minutes to process, and dozens or even hundreds of samples can be processed simultaneously. Thanks to its simplicity and rapidity, the test was used to help the campus safely reopen.

Pictured Above / Asst. Prof. Naama Geva-Zatorsky heads a lab in the Rappaport Technion Integrated Cancer Center at the Rappaport Faculty of Medicine. She is also affiliated with the Russell Berrie Nanotechnology Institute at the Technion.

## » *Creating a Sustainable World*

Ph.D. candidate Rawan Halabi (pictured above) of the Department of Material Science and Engineering has prototyped a system for efficient and safe production of hydrogen using only solar energy with fellow Technion alumna Avigail Landman. The system will split water into hydrogen and oxygen, offering an infinite, clean energy supply to help solve one of many critical issues in environmental sustainability.



From its earliest days developing sustainable water sources for crops in Israel, Technion innovation has helped Israel do extraordinary things despite its limited natural resources. That legacy of inventiveness and originality lives on today, as the Technion pioneers renewable energy sources, green materials, and tools for smart cities.

The Technion is home to two research initiatives dedicated to identifying and developing novel sustainability solutions: the Nancy and Stephen Grand Technion Energy Program (GTEP) and the Stephen and Nancy Grand Water Research Institute (GWRI). Like other multidisciplinary hubs at the Technion, both GTEP and GWRI bring together expertise from across academic fields, industry, and the public sector to tackle challenges differently. With the same Israeli ingenuity and fire for problem-solving that brought water to Israel, GTEP and GWRI are helping humankind protect and sustain our planet.

GTEP researchers investigate how to meet the global demand for cleaner, more versatile, and more efficient energy sources, including alternative fuels, renewable energy sources, and energy conservation. GWRI studies how to best manage Israel's precious water resources by studying pollution, desalination, and water quality.

Both GTEP and GWRI have been instrumental in helping Israelis live better, more sustainable lives — and the world is taking notice. Many of the innovations first developed at GTEP and GWRI for Israel have been adopted widely, helping people all over the world live in harmony with our planet.

### Catalysis

Catalysis is the key to modern life, yet poses one of the greatest unmet environmental challenges to societies worldwide. Catalysts increase or accelerate

a reaction without being consumed, playing a vital role in everything from green energy to targeting cancer cells to feeding the world. Ninety percent of all products on the market use a catalyst in at least one step of their manufacturing processes. However, many of those catalysts use highly toxic, rare-earth elements and are highly inefficient. More sustainable catalysts are necessary to meet humankind's demand without further damaging our planet.

The new Technion Center for Sustainable Processes and Catalysis brings together scientists, engineers, and industries from diverse fields to develop novel catalytic technologies and applications. The Center will be the first of its kind in Israel and will consist of four core facilities, located in the Schulich Faculty of Chemistry in the heart of the campus, serving the Technion catalysis community and industry. Notable is the Reaction Discovery and Catalyst Development Facility, with state-of-the-art robotic instrumentation for high throughput screening, assessment, and discovery of new catalysts for chemical synthesis and environmental studies.

Throughout Israel's history, the Technion has helped Israel stretch limited resources for the prosperity of its people. This new Center is yet another example of what happens when you apply Israeli grit to Technion creativity. The Technion Center for Sustainable Processes and Catalysis will transform catalysis research and highlight the Technion's strengths as a global innovator committed to moving research into industrial applications with real-world impacts.

### Energy

From the beginning, modern Israel's pathway to nationhood has always included a commitment to *Shomrei Adamah*, the sacred obligation of its citizens to be Keepers of the Land. Throughout the Technion's

history, its commitment to sustainable technologies keep the State of Israel — and the world — healthy.

In the coming years, the Technion will continue to harness the power of science and collaboration to create a cleaner, greener, more sustainable planet. At GTEP, researchers are developing alternative fuels, energy storage and conversion solutions, renewable energy sources, and energy conservation strategies to power the 21st century.

Prof. Gideon Grader of the Faculty of Chemical Engineering and Prof. Avner Rothschild of the Faculty of Materials Science and Engineering, together with Drs. Hen Dotan '08, Ph.D. '14 and Avigail Landman '13, Ph.D. '19, launched H2Pro, a startup based on a novel technology generating hydrogen and oxygen from solar energy. The technology allows hydrogen — expected to play a major role in the mobility, transportation, industrial, and energy-storage sectors — to be produced with an unprecedented 98.7% energy efficiency.

The concept was researched at the Technion over the past several years as part of GTEP's activity in the Hydrogen Technologies Research Laboratory and in the Ed Satell Family Nitrogen–Hydrogen Alternative Fuels Reaction Research Laboratory. H2Pro recently moved its activities from the Technion to the Caesarea Industry and Business Park, where it employs 20 people, mostly Technion graduates. H2Pro has attracted the interest of key players in the investment community including Hyundai Motor Company and Bill Gates, now lead investors.

## Food

Experts predict that the global population will reach 10 billion by 2050, leading to food insecurity in many parts of the world. The Technion is identifying novel ways to grow food in more sustainably, reduce wasteful

packaging, and optimize nutritional benefits using emerging food technologies.

Recent innovations include using bioreactors to mimic human digestion to tailor foods to infants and the elderly; NanoPack, the antimicrobial food packaging solution using natural nanomaterials developed by Prof. Ester Segal; Prof. Shulamit Levenberg's lab-grown meat that tastes like its real counterpart; and an innovative system for monitoring water and heat stress in crops, developed by Professor Ron Kimmel.

Efforts like these, and the new Carasso FoodTech Innovation Center, are ways the Technion is helping ensure all of humankind can grow and access reliable, nutritious foods.

## Water

GWRI promotes and supports research and management of Israel's water resources, developing tools that are now in use throughout the world. One such project, led by Assoc. Prof. David Broday and Assoc. Prof. Eran Friedler of the Faculty of Civil and Environmental Engineering, is a standalone moisture harvesting system that produces water from the air, even in arid regions. The innovative system is technologically superior to existing systems and is capable of providing a constant supply of water, especially to small and isolated communities, without the need for an external power source and without the need to transport water over long distances.

In contrast to existing relatively inefficient and expensive methods of moisture harvesting, the new system separates water from the air before cooling it. This means energy is used only to cool the moisture itself and convert it into available water, while also ensuring the collected water is cleaner as well. Assoc. Profs. Broday and Friedler have built a prototype and are performing simulations to see how the system would function in different climatic and humidity conditions.



Profs. Eran Friedler and David Broday of the Faculty of Civil and Environmental Engineering have developed a model for a system that separates the moisture naturally present in the air around us and converts it into drinking water. Their work has already drawn the attention of T3, the Technion Technology Transfer, which facilitates the transformation of ideas into real-life, applied solutions for the commercial sector.

Pictured Above (l-r) / Prof. David Broday, Prof. Eran Friedler, Ilan Katz, and Liron Houber '21



## **» Boosting the Israeli Economy Through Smart Industry**

Israel is known the world over as the “Start-up Nation.” A critical reason is the Technion, which has played an outsized role since its opening nearly 100 years ago. The Technion gave birth to Israel’s technology-based industry, creating jobs, new businesses, and a strong national standard of living on par with the leading Western economies.

**A**s the Start-up Nation, Israel has led the high-tech revolution, and the Technion has played an outsized role in that achievement. Technion graduates helped found 70% of Israel’s startups and created the \$10 billion aerospace sector, employing more than 100,000 people. In just 50 years, Israel’s gross domestic product jumped from less than \$1 billion to nearly \$400 billion today — and the Technion is to thank for the country’s ascendance from austerity to economic success.

Yet while Israel is a global leader in high-tech innovation, the country’s high-tech capacity remains woefully underutilized by much of its industrial and domestic manufacturing bases. If Israel does not make bold moves to integrate emerging technologies across its manufacturing industries, the country could be frozen out of global value chains and rendered incapable of expanding its consumer base.

To promote cutting-edge technologies throughout Israel’s manufacturing landscape, the Ministry of Economy and Industry established a National Institute for Advanced Manufacturing in January 2020. The Institute supports collaborations between industry, academia, and international partners, to initiate and support research and development collaborations, and channel technological expertise to bridge gaps within the manufacturing base.

To transform this work — and propel the Israeli economy to even higher heights — the Technion is establishing its own Center of Advanced Manufacturing, which will harness Israel’s unique creativity and

problem-solving abilities, global industry, and the Technion’s expertise around smart industry.

Building on the Technion’s wealth of knowledge in the fields of artificial intelligence, robotics, cloud computing, big-data analytics, and the Internet of Things (IoT) architecture, the Center will attract global thought leaders from industry and academia. These experts will lend their expertise, experience, and international perspectives to help transform manufacturing in Israel.

Recognizing that the Technion must produce the engineering and management leaders who will implement this new vision in the decades to come, the Center will also educate promising undergraduate and graduate students. The Center will take a unique approach to curriculum development, with students’ disciplinary focus supplemented by training and education through other Technion research centers, such as the Russell Berrie Nanotechnology Institute (RBNI), the Grand Technion Energy Program (GTEP), and the Autonomous Systems Program, as well as new centers that are currently being planned. This rich educational environment — paired with the Technion’s unmatched expertise in these fields — is expected to attract some of the world’s most promising students, who will in turn contribute their own insights and innovations to Israel’s advanced manufacturing landscape.

The Center is expected to make Israel and the Technion a world-recognized hub of advanced manufacturing technology, and research and development. The technologies coming out of the Center will transform how we live, work, and play, and will shape the future of Israel’s industrial base.

“*Israel is a country of entrepreneurs. When we sent out a call for proposals for coronavirus research projects, 900 companies applied in no time, within two weeks. Some of the companies proposed restructuring entire production lines. It’s a testament to Israelis’ agility.*”

**— Aharon Aharon, senior advisor to the Technion on industry-academia relations and project leader of smartifying northern Israel’s industrial base**

# LEADERSHIP OF TOMORROW

The trailblazers already making history at the Technion



Traditionally, university professors were the sole authority in their fields. But in the era of Google and Wikipedia, people no longer look to academia for all the answers. To remain competitive, the Technion provides students with something they cannot get online: **leadership skills, ethics, entrepreneurship, and environmental awareness.** These are the elements that students need to become the leaders of tomorrow.

The Technion is also preparing for a revolution in how classes are taught. Rather than a traditional, lecture-focused institutional approach, the courses of tomorrow will have students learning away from the classroom, then applying what they learned within the classroom setting. To prepare for this, the Technion prioritizes faculty recruitment.

Pictured Above / Six of the Technion's seven women deans  
(Bottom row l-r) Prof. Marcelle Machluf, dean of the Faculty of Biotechnology and Food Engineering, and Prof. Yael Mandel-Gutfreund, dean of the Faculty of Biology; (second row l-r) Prof. Idit Keidar, dean of the Andrew and Erna Viterbi Faculty of Electrical and Computer Engineering, and Prof. Ayelet Fishman, dean of Students; (top row l-r) Prof. Tali Tal, dean of the Faculty of Education in Science and Technology, and Prof. Gitti Frey, dean of the Faculty of Material Sciences and Engineering  
(Not pictured: Prof. Stavit Alon-Shalev, dean of Continuing Education and External Studies)

» *Professor Daniella Raveh*



Prof. Daniella Raveh '92, Ph.D. '99, studies aeroelasticity, the interaction between aerodynamic forces and the flexible structures of aircraft. As aircraft become more streamlined in an effort to reduce fuel consumption, Prof. Raveh is focused on measuring, quantifying, and controlling negative aeroelastic phenomena, while also discovering ways to use aeroelastic properties to make aircraft more environmentally friendly.

Recently, she moved from the theoretical to the literal, building a 3D-printed unmanned aerial vehicle (UAV) that will serve as a platform for aeroelastic experimentation. The Active Aeroelastic Aircraft Testbed (A3TB) is a lightweight aircraft with a large wingspan, reducing drag forces to cut energy consumption and pollution. Its maiden May 2020 test flight showed the plane could fly straight and horizontal at sea level when launched from a moving vehicle.

*"We have some brilliant students and I want to give them the best overall mix of knowledge, training, facilities, and experiences, because they will be the ones doing groundbreaking work in service of the country and our research community."*

— Prof. Daniella Raveh

"In my work I hope I am making a contribution to the security of Israel by working with the air force and other companies, and also contributing to the scientific community," she said. "But my greatest contribution, I hope, is in raising the next generation of aerospace engineers. We have some brilliant students and I want to give them the best overall mix of knowledge, training, facilities, and experiences, because they will be the ones doing groundbreaking work in service of the country and our research community."

Prof. Raveh is particularly interested in supporting young women. "Yes, I'm a woman in aerospace engineering," Prof. Raveh said. "And I hope that in the very near future, the question of being a woman in aerospace won't be interesting." While the Faculty of Aerospace Engineering only has two women, female enrollment has seen an increase through events like "Touching the Skies," in which high school students are invited to the Technion to learn about aerospace.



## » Professor Marcelle Machluf

Prof. Marcelle Machluf's high school chemistry teacher told her she'd never be a successful chemist. But this *Lady Globes* Woman of the Year is now one of the leading scientists in the field of cancer and drug delivery research.

Prof. Machluf made aliyah from Morocco as a 1-year-old with her single mother. She remembers after school, she'd balance her schoolwork with helping her mother clean offices. Despite — or perhaps in spite of — her teacher's harsh assessment, she went on to complete her postdoctoral studies at Harvard Medical School. But she wasn't done yet.

Today, Prof. Machluf is the dean of the Technion Faculty of Biotechnology and Food Engineering, head of the new Carasso FoodTech Innovation Center, and a world-renowned expert in cancer and drug delivery research and tissue regeneration. She's authored more than 80 peer-reviewed journal papers and been cited more than 2,800 times. She has six national and two international patents for her work, and has received dozens of international awards in recognition for her contributions to the field of medical science and public health.

Prof. Machluf has developed scaffolding for tissue engineering of the pancreas, heart, and blood vessels, as well as carriers for cell delivery that could help treat diabetes and more. But she is perhaps best known for her targeted drug delivery system, NanoGhosts.

NanoGhosts are modified stem cells that precisely target tumors, unleashing cancer-fighting drugs at the site of a tumor where they are needed most. At the time scientific journals thought her research, which showed the NanoGhosts reduced tumor size by 85%, was too good to be true. Today, it is known as one of the most promising technologies ever developed in Israel, and Prof. Machluf recently received a \$5 million investment from Israel's aMoon fund, a health technology and life sciences fund, to develop NanoGhosts further. The technology is now patented in the United States and Europe, with additional patents pending in India and China.

Prof. Machluf is an Israeli icon. Her work on drug delivery systems, including NanoGhosts, led to the Israeli Ministry of Science and Technology naming her one of Israel's 60 most impactful scientists in the field of advanced cancer therapies. She was selected to light a torch at Israel's 70th Independence Day Ceremony. In 2018, *Lady Globes* magazine named her Woman of the Year. Yet despite those accolades, Prof. Machluf is happiest in the lab, always on the hunt for the next big breakthrough.

“That’s the amazing thing with research: It never stops. If you achieve one goal, then you have another goal to achieve.”

— Prof. Marcelle Machluf  
to *The Jerusalem Post*



## » Professor Roy Kishony

Prof. Roy Kishony, the Henry and Marilyn Taub Professor of Life Sciences in the Faculty of Biology and head of the Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering at the Technion, has left no stone unturned during the COVID-19 pandemic.

He worked with researchers at Rambam Health Care Campus to develop a COVID-19 “pooling” test, which used PCR molecular testing to analyze dozens of test swabs simultaneously. The approach promises to be able to test more people more quickly — while saving on chemical reagents and other equipment that was in short supply during the pandemic.

He investigated the impact of COVID-19 vaccines, discovering that people who contract COVID-19 after being vaccinated are significantly less infectious, even if they have received only one of their vaccine doses — a finding that leading vaccine researchers called a “game-changer” that answered one of the biggest questions the medical field had about the vaccines.

Prof. Kishony also confirmed the overall vaccine efficacy of the BioNTech/Pfizer vaccine in Israel, providing expert validation at a moment when some were skeptical of the new vaccines. He discovered a correlation between the increase in vaccinated adults and a decrease in COVID-19 cases among children.

Reading these accomplishments, you might assume Prof. Kishony has been studying COVID-19 his entire life. In a way, he has. He's one of the world's leading experts in the field of antibiotic resistance. His groundbreaking discoveries include methods to better predict the resistance of a given bacterium to various antibiotics, allowing physicians to develop customized antibiotic treatments for patients and more effective antimicrobial chemotherapy. His lab has also pioneered unique experimental and theoretical methodologies for tracking whole-genome evolution of pathogenic bacteria, as well as studied the efficacy of “antibiotic cocktails” to determine the most effective combination of drugs for a particular patient.

In recognition of his many achievements, Prof. Kishony received the Genzyme Outstanding Achievement in Biomedical Science Award (2009), a Gates Foundation Grand Challenge Award (2008), a Complex Systems Award from the James S. McDonnell Foundation (2008), and the Sanofi-Institut Pasteur Award (2013). He has been elected as a member of the Israeli Young Academy (2016) and a member of the European Molecular Biology Organization (2017). His research has been featured at the United Nations and has been covered by *CNN*, *NPR*, *Wired*, *Wall Street Journal*, *The Boston Globe*, *Scientific American*, *Nature News*, *60 Minutes Australia*, and the *BBC*.



## » **Neta Blum** *M.S. '18, Ph.D. '22*

The Technion has always been a part of Neta Blum's life. Her father, a cardiologist, was a Technion graduate himself. It was only natural that when Neta returned to Israel from the United States at age 17, she joined the Brakim excellence program, a joint initiative of the Technion and Israel Defense Forces (IDF) that, in four years, combines military service along with the acquisition of both a bachelor's and master's degree in mechanical engineering.

Today, she is finishing her Ph.D. in the Faculty of Aerospace Engineering at the Technion, investigating the validity of Saint-Venant's principle (SVP), a tenet of structural mechanics that examines stress distribution of forces on elastic materials. Blum is exploring how the principle works in soft biological tissues. She hopes her research will help physicians diagnose and treat cancer and cardiovascular diseases more effectively in the future.

That alone would make for an impressive resume. But alongside her demanding work at the Technion, Blum also leads the cyber section at the Ministry of Defense.

Additionally, she is paying it forward for the next generation. In Brakim and in her work at the Ministry of Defense, Blum was often the only woman in the room — a reality she was determined to change. She began by visiting high schools across Israel, encouraging young girls to go into science, technology, engineering, and mathematics (STEM) fields. The success of those visits spurred her to launch AT (Hebrew for “you,” feminine), which recruits the best female tech leaders in Israel — women from Google, Microsoft, even scientists from the Technion — to encourage young girls all over the country to pursue careers in STEM.

By leading through example and her own acts of service, Blum is inspiring the next generation of women to pursue their ambitions at the Technion.

“Every day through my research and service, I wake up knowing that I am doing something for a bigger cause. I'm driven because I know what I am doing is helping Israel. And the Technion is a big part of that.”

— Technion alumna  
Neta Blum

## » **Dr. Yehuda Sabiner** *'16, MD '19*



Dr. Yehuda Sabiner is a graduate of the Technion's Rapaport Faculty of Medicine. He is the first Israeli-born member of the ultra-Orthodox community to graduate from medical school.

Growing up a Hasid, Dr. Sabiner's secular education ended when he was 13. Afterward, he spent his days at the yeshiva, studying Jewish texts exclusively. However, Dr. Sabiner harbored a secret: Ever since he was a child, he'd dreamed of being a doctor, a profession nearly unheard of for a Haredi.

In order to fulfill his childhood dream, he attended the Technion's *Mechina*, a demanding preparatory program that helps students from disadvantaged backgrounds pursue higher education. Despite beginning *Mechina* without knowing any math more complicated than simple arithmetic, he eventually aced the highest-level math and physics courses.

He was accepted to the Technion in 2013 and decided to pursue internal medicine. The support and mentorship he received in *Mechina* continued through medical school, with the Technion providing scholarships and tutoring to help the promising student reach his dreams. He completed a monthlong rotation at the prestigious New York-Presbyterian/Weill Cornell

Medical Center in Manhattan, working with renal transplant patients and donors, checking patients' immune systems, and following up on surgeries.

It was there where he realized how well prepared he was, thanks to his studies at the Technion. “I was worried that I'd be on a team with some geniuses and that I really wasn't going to have any clue how to deal with the knowledge they have,” he said. “But I never had a moment where I was face-to-face with something I didn't understand. I can now say that I studied in one of the best places in the world, the Technion.”

After graduating in 2019, Dr. Sabiner pursued his medical internship at the Chaim Sheba Medical Center in Israel's Tel HaShomer, named by *Newsweek* as one of the world's 10 best hospitals. He worked on the frontlines of the coronavirus pandemic and led outreach to the Orthodox community to ensure that the community adhered to COVID-19 containment protocols.

He has also been encouraging other ultra-Orthodox to pursue medicine, leading the group Haredim in Medicine, and conducting outreach through Facebook to ultra-Orthodox men and women interested in medical careers.

# VISIONARY EDUCATION



## DEEPENING TIES BETWEEN INDUSTRY AND ACADEMIA

Since its inception, the Technion has questioned, redefined, explored, and innovated. As a university by and for the State of Israel, it embodies the very best of the country and continues to be grounded in *tikkun olam* for the benefit of humankind.

Rather than competing with global industries, the Technion is bringing them onto campus, so students and researchers alike can benefit from firsthand access to technology and information from some of the world's most cutting-edge companies. Collaborations with vaunted organizations like Hyundai, Ford Motors, Fujitsu, and others allow students and faculty to learn from and with some of the best in the world.

By bringing together the best minds inside and outside the Technion, including those in local and global industries, the Technion is able to accelerate innovation through intense collaboration and creativity.

Pictured Above / Head of Intel AI Product Group (AIPG) Naveen G. Rao (left) and Vice President for External Relations and Resource Development Prof. Boaz Golany (right) at the inauguration of the Center for Artificial Intelligence at the Technion in 2018.



## By the Numbers

For the 2020-21 Academic Year



**60**

Undergraduate Programs



**60**

Research Centers

**83**

Graduate Programs

**106**

Buildings on Campus



**15,581**

Number of students

**11,296**

Undergraduate Students

**2,990**

Graduate Students

**1,295**

Doctoral Students



**3,120**

Number of degrees awarded

**1,939**

Bachelor's

**827**

Master's

**199**

Ph.D.

**155**

M.D.

For nearly a century, the Technion has played a critical role in building the modern State of Israel. Its students, faculty, and innovations have propelled the University into a globally ranked institution. Today it serves as a hub for coexistence, diversity, and excellence.

- Female students make up 50% of graduate students and 44% of the overall student body
- 20% of students are Israeli-Arab, mirroring the makeup of Israel's demographics
- There are over 1,000 international students from 30+ countries
- The Technion offers special programs for students from underserved communities and for ultra-Orthodox adults who lack a secular education

Pictured Left / Dr. Hanan Abumanhal Masarweh Ph.D. '21 focused her research on a particularly aggressive form of breast cancer and, with other Technion researchers, developed nanometric particles containing baking soda that could improve the effectiveness of anti-cancer therapies.



## Ensuring a Thriving Technion and a Safer Israel

Your support allows the Technion to make bold investments that benefit the State of Israel — and the world.

The Technion's achievements are made possible by people like you, who are deeply committed to the Technion's success and Israel's future. Your generosity allows the Technion to invest in people, ideas, and innovations that serve the State of Israel and continue the Technion's legacy of *tikkun olam*.

By becoming a partner in this work, you are supporting the next generation of visionary scientists, entrepreneurs, and problem solvers making history. We are grateful for your generosity.

Pictured Above / Jeff Polak (left) with his mother, Janet, and children at the David & Janet Polak Visitors Center at the Technion



A M E R I C A N  
T E C H N I O N  
S O C I E T Y

The American Technion Society supports visionary education and world-changing impact through the Technion - Israel Institute of Technology. Since 1940, our nationwide supporter network has funded Technion scholarships, research, labs, and facilities that have helped deliver world-changing contributions and extend Technion education to campuses in three countries.

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