TECHNION USA

AN AMERICAN TECHNION SOCIETY PUBLICATION / JULY 2020

Community Is IMMUNITY

SCIENCE SAVES LIVES

The interdisciplinary approach to fighting COVID-19

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"CRISIS CAN TURN INTO A SOURCE OF STRENGTH AND INSIGHT."

President Uri Sivan leads the Technion during the pandemic and looks beyond the current global crisis.

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Jon Hirschtick,
ATS Genesis Circle Member

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Major Photography

Stephanie Schuyler
Graphic Designer

ATS Leadership
Steve Berger
President

Zahava Bar-Nir
Chair of the Board

Michael Waxman-Lenz
CEO

National Office
55 East 59th Street
New York, NY 10022
212.407.6300
ats.org

A MESSAGE FROM
THE PRESIDENT AND THE CEO


Michael Waxman-Lenz, ATS CEO, and Steve Berger, ATS president

We are addressing you here for the first time since assuming our respective offices: Steve Berger as the American Technion Society (ATS) national president and Michael Waxman-Lenz as CEO. We're excited to take the helm at a moment in which the Technion - Israel Institute of Technology's impact on Israel and the world is greater than ever.

Not only are Technion faculty, students, and alumni foundational to Israel's technology-driven economy, but they are increasingly bringing research to the marketplace with startups and devices for the benefit of all. In this issue of *Technion USA*, we shine a light on some of those new ventures as well as faculty in the news, outstanding students, and amazing research.

Faced with the coronavirus pandemic, Technion scientists placed their long-standing research on hold to tackle the virus. At the time of this writing, at least 50 COVID-19 projects were underway in areas including therapeutics, diagnostics, and the development of game-changing personal protective equipment. Students at the Joan & Irwin Jacobs Technion-Cornell Institute at Cornell Tech in New York City and fellows in its Runway Startup Postdoc Program also pivoted from their daily activities to address the pandemic.

It's moments like these that test an organization. And we couldn't be prouder of the scientists — and of our entire Technion community.

During the period of isolation, it was all hands on deck at the ATS. We were able to connect our Technion scientists and alumni with people all over the world through the *Live From Technion* webinar series, hold a virtual meeting of the National Board of Directors, and publish this magazine.

But it is you, our devoted ATS supporters, to whom we are most grateful. Despite the uncertain times and difficult economic circumstances, you have supported Technion students in need and coronavirus-related research projects through our Emergency COVID-19 Response funds, and have continued to contribute to our ongoing Technion Fund and Global Campaign. Thanks to your generosity, the Technion is advancing innovation that is changing the world. We appreciate your partnership and commitment.

We've dealt with setbacks in the past, and there's always been a recovery. It is our belief that we'll be stronger for having weathered these challenges together.

Sincerely,

Steve Berger
President

Michael Waxman-Lenz
CEO

Q&A

THE TECHNION RESPONSE TO A GLOBAL PANDEMIC AND BEYOND

A conversation with Technion President Uri Sivan

Technion President Uri Sivan entered office on October 1, 2019 — just before COVID-19 spread rapidly across the globe. American Technion Society (ATS) CEO Michael Waxman-Lenz spoke to him recently to learn more about leading a world-class science institution in combating a pandemic, and about his broader goals and vision for the university. As the institution's 17th president, Professor Sivan has a rich legacy to draw on — and despite the current challenges, a bright future to create.

Michael Waxman-Lenz: Your tenure as president began just as the coronavirus was starting to spread. Can you give us a glimpse into what went on during that time for you and the university?

Uri Sivan: It was a challenging start! But it showed me right away how robust and flexible the Technion is at all levels. Firstly, we moved to fully online learning in just 10 days for all classes for over 15,000 students.

Secondly, within less than a month, more than 50 labs around campus diverted their research to COVID-19 related challenges. The range of topics was dazzling, from AI and big data to diagnostics, drug delivery, and improving protective gear. That gear, by the way, is in use in Israel and in the U.S.

Can you give us more detail on what Technion labs are working on and on what they have already achieved?

With many projects in development, it would be impossible to do justice to all of them, but here are some examples.

President Uri Sivan with Michael Waxman-Lenz at the Technion in Haifa, Israel

Professor Josué Sznitman, from the Faculty of Biomedical Engineering, is working on a project that started long before the coronavirus, but it addresses one of the virus' main challenges to treatment: effectively transferring drugs to the lungs.

Another project, from Professor Naama Geva-Zatorsky of the Rappaport Faculty of Medicine, is the development of a simple at-home diagnostic kit to test for the virus. This is in very advanced stages of trials and, if successful, it will be a game-changer.

Professor Ezri Tarazi, from our Industrial Design Program, has designed protective gear for frontline medical staff. His device directs a curtain of air across a face shield, pushing pathogens away, clearing the protective screen, and keeping the wearer cool.

What have you been surprised to learn or happy to witness since the start of your presidency?

I have been heartened by the solidarity between our staff, faculty, students, and supporters. When the crisis started, most of our students lost their jobs, and many lost their family's financial support. But we found it unacceptable for even one student to quit school due to economic hardship. So, with the help of the American Technion Society, the Israel Technion Society, and other organizations around the world, we established funds for student support and for research. Also, in cooperation with our senior faculty organization, we established a fund for staff's and teachers' families experiencing loss of income or other challenges. Our supporters have been very generous, and everyone appreciates feeling like they are not alone. It has been heartwarming. You can see that we really are a family.

What do you envision will be the most important reforms for the university over the next decade?

There are three major areas where we have work to do: increasing the interdisciplinary nature of research, expanding the role of the university, and rethinking the connections between academia and industry.

The traditional university structure is based on separate faculties and disciplines — but the grand challenges of the 21st century are multidisciplinary by nature. Human health, for instance, spans practice and research in many areas: medical, biological, engineering,

> Our vision is to provide the best education to serve society and educate the leaders of tomorrow, carrying out cutting-edge research for humanity, and serving as a beacon for pluralism, equality, and freedom of speech.
>
> **| Prof. Uri Sivan**

data science, etc. A major challenge, especially at a university like the Technion, is to bridge those disciplines. To do that, we are restructuring research around major challenges of the 21st century: human health, energy sustainability and environment, and advanced manufacturing.

Universities have lost their monopoly over information as a commodity. Anyone can find answers via Google or on Wikipedia, or take online courses on any topic. So, the role of a university is to do more than teach. It should mentor students and give them a broader perspective. To that end, we are currently crystalizing a program we call "The Rounded Engineer," to educate the leaders of tomorrow, giving students not just knowledge in their discipline, but societal perspective, environmental awareness, familiarity with issues of diversity, and ethics.

There has been a tectonic change in the traditional division of roles between academia and industry, with the two focusing on fundamental and applied research, respectively. With these changes, we need to figure out how to live with each other. One thing we are doing is bringing industry deeper into campus, with more teachers and mentors coming from industry. Another is streamlining technology transfer from the Technion to industry.

What role does philanthropy play in the growth and development of a university?

Philanthropy is absolutely critical. Our development depends on philanthropy — new labs, infrastructure, and funding high-risk research. Without it, we could not maintain our status as a leading technological university.

How do you view the academic spirit at Technion? What challenges does it face in today's climate, and how do you plan to preserve it?

As we touched on before, a university in my perception is far more than just teaching. We need to educate people, to let them develop into rounded human beings sensitive to their environment, to their communities. We would like our graduates to be responsible for what happens around them, in addition to, of course, being excellent professionals. A wonderful project run by [Professor of Mechanical Engineering] Alon Wolf creates sophisticated artificial limbs for children, and the effect is incredible — for the recipients but also for the students working on it. They see the ways technology can really affect society.

Your parents came to the Technion in 1936 because European universities had closed their doors to Jews. What are you doing to preserve and expand the university's commitment to pluralism and diversity?

If you read the Technion vision from the 1920s, when the university had just opened its gates, you will see a clear statement that it should serve all people — Arabs, Jews, immigrants, and others, with no discrimination for sex, religion, or anything else. That has been the philosophy right from the beginning. We will do whatever it takes so that everybody feels comfortable on campus. Our vision is to provide the best education to serve society and educate the leaders of tomorrow, carrying out cutting-edge research for humanity, and serving as a beacon for pluralism, equality, and freedom of speech.

Thank you, Uri, for sharing your thoughts, vision, and goals for the Technion during coronavirus and beyond. Is there anything else you would like to add?

We are overwhelmed by the friendship and partnership of our supporters. Not only do we have their moral support, their participation, and their partnership in our vision, but also their support is critical in helping us to maintain our standards and pursuit of our long-standing values. It's heartwarming to have such supporters, some of whom go back four generations. I am proud of being part of that family. ■

(L to R) **President Sivan, ATS Chief Development Officer David Chivo, ATS National Board Member George Elbaum, and Technion Vice President for External Relations & Resources Development Professor Alon Wolf**

ATS donors Mauro and Raquel Wjuniski

> The 'Start-Up Nation' was inspired by the Technion. Israel's economy was leveraged by Technion alumni and their inventions.
>
> | **Mauro Wjuniski B.S. '75**

What the Technion Gave Us:

A CHANCE TO RETURN THE FAVOR

Mauro Wjuniski knows firsthand what a Technion education can do. He was a kibbutznik with no income when he decided to study at the university. He was accepted into the Technion, landed a scholarship, and graduated in 1975 with a degree in electrical engineering.

"Today, I am an investor in high-tech companies in Israel and the U.S., and I started from zero," said Mauro, explaining why he is passionate about supporting his alma mater.

The 71-year-old lives in Aventura, Fla., where his wife Raquel's watercolors adorn the walls of their home. The couple funds Technion student fellowships and First Steps, a faculty recruitment program. Their desire to give back extends beyond financial support: Mr. Wjuniski chairs the American Technion Society (ATS) Miami Leadership Council and is a member of the Technion Board of Governors and the ATS National Board of Directors. Mrs. Wjuniski, a retired nurse as well as an artist, hosts ATS meetings at their home. They have participated in several ATS trips to the Technion presences in Haifa, China, and New York.

"Alumni know that the Technion diploma is the best in the world," he said. "I think we have to give back what the Technion gave to us."

Mr. Wjuniski was raised in Brazil, the son of a salesman and a secretary. His parents were Zionists, so he always longed to see Israel. The Technion, he said, changed his life.

"In the technological field, you have to keep learning and be up-to-date at all times. The Technion taught me how to study," he said. "It gave me the technological basis and capability to learn new things."

After graduation, Mr. Wjuniski worked for Israel's Elscint Ltd., which specializes in diagnostic imaging, and helped bring the first CAT scan to Israel. Two years later, he returned to Brazil, where he opened a subsidiary, and eventually became president of Elscint's Latin American division. He headed two companies in Brazil before moving to the United States in 2004 to start his own company, Alma Lasers North America.

In 2014, prompted by a friend, he attended a Technion event. It sparked an interest he didn't realize he had — supporting his alma mater. One of the first things he did was sponsor a graduate student's education, remembering how a scholarship had helped him earn his Technion undergraduate degree. Soon he was giving financially, attending meetings, and reaching out to other graduates in the Miami area. He was hooked.

"It's important to spread the word about the Technion," said Mr. Wjuniski, who works tirelessly to attract alumni and other members of the Jewish community to local ATS events. "The 'Start-Up Nation' was inspired by the Technion," he said. "Israel's economy was leveraged by Technion alumni and their inventions."

One of his favorite projects is the Helen Diller Center for Quantum Science, Matter and Engineering. "The Technion has to stay on the cutting edge of science and technology," he said. And with supporters like the Wjuniskis, it will. ■

DESIGNER GENES

Asst. Prof. Ramez Daniel with doctoral candidate Natalia Barger

An electrical engineer finds a new outlet for his work: the human body

TECHNION IMPACT / THE KEY TO ISRAEL'S PROSPERITY

You could say tinkering is in his genes. When Ramez Daniel was only 12, he cobbled together a car that ran on electricity. Now the assistant professor in the Faculty of Biomedical Engineering at the Technion tinkers with a very different kind of material: human cells. Prof. Daniel works in the fast-growing field of synthetic biology to understand how these fundamental units of life can be engineered to treat diseases and warn of dangerous medical conditions.

While pursuing his bachelor's degree at the Technion and his graduate studies at Tel Aviv University, Prof. Daniel designed electrical circuits. "At my heart, I am a designer," he said. Looking to solve new challenges with his design skills, Daniel conducted his postdoctoral research in the then-nascent field of synthetic biology at MIT. Synthetic biology introduces new behaviors in living cells by injecting protein networks. Using engineering concepts, these networks can be designed to respond in certain ways to external conditions.

Just like a computer processes signals from electrons, a cell can be made to process signals from chemicals. Prof. Daniel's recent research focuses on the enzyme luciferase, present in many bacteria. When injected into cells exposed to toxic chemicals such as ethanol or nucleic acids, the luciferase lights up. It's essentially like a canary in a coal mine, signaling danger.

Prof. Daniel's research, conducted with doctoral candidate Natalia Barger, focuses on how these cells generate light as a response to "multi-input" conditions, that is, in the presence of more than one toxin. Such a method, Prof. Daniel said, can be used to detect toxins in urine samples or warn of bleeding in the gut.

Research in synthetic biology is still at the cellular level but the potential is enormous, he said. "We can build bacteria that can detect the concentration and type of toxins in food and water." Another promising application: viruses that can detect and bind to tumor cells, then release a protein that triggers the body's immune system to destroy the cancerous cell.

Prof. Daniel grew up in Nazareth, where his father, who owned a carpentry shop, encouraged him to build things with his hands. "My father didn't finish school, but he taught me about famous scientists," Prof. Daniel said. He gravitated to electrical engineering and worked as a design engineer in Israel's Tower Semiconductors from 2000 to 2007, studying how to build complex engineering circuits. But academia always exerted a strong pull; he left to pursue graduate studies and eventually returned to the Technion as a faculty member in 2014.

The Technion has provided room for Prof. Daniel's interdisciplinary approach. He is affiliated with the Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering. "I thank the Technion for believing in my vision, the Neubauer Family Foundation for supporting my research, and most important, my students and lab researchers," he said.

"To solve challenges like disease and those related to food and water, we need systems based on living materials. Electronics alone is not enough," Prof. Daniel said. "Synthetic biology is the next revolution." ■

(L to R) **Prof. Roy Kishony, Einat Tamar, Amir Argoetti, Noga Aharony, and Dr. Idan Yelin**

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HOW THE TECHNION IS PUTTING COMMUNITY FIRST AND USING AN INTERDISCIPLINARY APPROACH TO HELP FIGHT COVID-19

The COVID-19 pandemic is a crisis tinged with uncertainty, but "such a crisis can turn into a source of strength and insight" when handled correctly, said Technion President, Professor Uri Sivan.

Grounded in the philosophy that "community is immunity," the Technion is focusing on a two-pronged approach: First, keep the community safe through accurate communication of the latest information and ensuring availability of essential supplies. The Technion Student Association has been providing food and other essentials to residents in self-isolation. Classes have been moved online and the university is working in sync with government authorities to ensure all recommended protocols are met. The Technion is also inviting donations for the COVID-19 Student Emergency Fund. Donations will aid students with financial challenges and help deliver psychological support and distance learning, among other pandemic-related services.

At the same time, the Technion is kicking interdisciplinary research teams into high gear. Case in point: A team of researchers from Technion and the Rambam Health Care Campus have successfully tested a "pooling" method that will dramatically increase the testing rate for the virus. Samples are pooled in batches of 32 or 64 and run through a test together. If they collectively come back as negative, it can be safely assumed that nobody in that group has the virus. If a positive result is flagged, only then is each sample run through again.

The pooling method is just one of the dozens of interdisciplinary projects that the Technion has launched in the wake of the pandemic. Collectively, they address almost every angle of the crisis: diagnostics like the pooling method and a test for asymptomatic coronavirus carriers, aid for medical teams such as the development of new antiviral disinfectants, and medicine delivery technologies. Faculty and students are also researching novel drug delivery mechanisms to the lungs, monitoring disease progression and learning from it, and using nanotechnology to trap the virus and develop vaccines.

"In the long term, one effect of COVID-19 on the Technion will be on intensification of research in multidisciplinary fields, which address the threat of epidemics and pandemics," said Prof. Sivan. "These include medical research, pharmaceuticals, big data, artificial intelligence, advanced manufacturing, digital health responses, and much more."

The multidisciplinary focus is evident in research conducted by Associate Professor Avi Schroeder and his lab colleagues. They used nanotechnology and other disciplines to develop an antiviral vaccine to cure a deadly disease in shrimp and are now adapting the technology to develop a COVID-19 vaccine for humans.

For his part, Prof. Sivan has reiterated the institution's commitment to the community and urges donations for the fund, which can help address immediate student needs and the long-term challenges that might unfold in the wake of the pandemic. The "community is immunity" emphasis underscores the broader message: Researchers, along with the student, faculty, and administrative bodies, are all part of a wider community at the Technion that are working together to address the pandemic. As Prof. Sivan said, "We will emerge from COVID-19 together with insight, strength, and resilience." ■

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MMUNITY

STUDENTS FROM ABROAD FEEL AT HOME, HUNKERING DOWN IN HAIFA

Patricia Mora Raimundo, a pharmacist and graduate researcher in Prof. Avi Schroeder's lab in the Wolfson Faculty of Chemical Engineering, has seen the "community is immunity" principles in action at the Technion. Raimundo is scheduled to complete her doctoral thesis work in October at the Universidad Complutense de Madrid. When the COVID-19 quarantines began in earnest, Raimundo weighed the decision about leaving Israel. Having sublet her apartment in Spain, she would have to live with her parents. Travel would leave her susceptible to infection, and Spain was increasingly becoming a hotspot for the virus. She was worried about potentially infecting her parents.

At the same time, she felt cared for in the dorm at the Technion. When her grandma had a fall in Spain, her colleagues at the Technion kept Raimundo company over the phone all day. Similarly, when she was nursing a sore throat, she received medical supplies and food. "Everybody at the lab is so nice and helping me. I think I'm going to be good here," Raimundo said. She has been working on a review and her doctoral thesis. In her spare time, she did learn an essential, something she had never attempted before: how to make a Spanish omelet. "It was quite good for my first one," Raimundo said.


Egor Egorov

Improving his cooking skills is also how Egor Egorov has been spending whatever little spare time he can find. Egorov, who is pursuing an internship in Prof. Schroeder's lab, intended to apply for a doctoral position at the Technion. When news about COVID-19 broke, he realized he couldn't return to Israel if he left. Egorov, who is from Russia but pursued schooling in England, originally intended to travel to England in April to play tournament hockey. The 23-year-old, who has studied medical biochemistry, has since shelved his travel plans and works in the lab three days a week.

Egorov has been very impressed by the security and containment operations that have kicked into place at the Technion. "The amount of information we have been getting from the institute speaks for itself," he said, adding that he has been touched by how the school is helping financially challenged students as well. In addition to cooking, Egorov has been leaning on an old faithful to get him through challenging times: Harry Potter.

Exercise helps, too. A fellow researcher used to be a boot camp coach and shares regimens through WhatsApp, Egorov said, adding with a laugh, "We take a picture of ourselves as proof that we have completed it." *See page 25 for more student response to the coronavirus pandemic.* ■

PROTECTING **ISRAEL'S SOLDIERS** ON THE FIELD

TECHNION IMPACT / SAFEGUARDING ISRAEL AND ITS PEOPLE

As a field service technician in the Israel Air Force, Mor Hayat B.S. '19 was responsible for preparing aircraft in the event of an attack. The planes had to be ready for action around the clock, recalls the recent Technion graduate. "The sirens could go off at four in the morning or nine at night. I needed to be alert all the time." Except she had a problem. She'd find herself falling asleep while making her security rounds.

"I fell asleep on the wings, inside the motor, under the wheels. I can't remember a place on the plane I wasn't falling asleep," she said. "It was scary and hard to function."

Diagnosed with narcolepsy, Mor put her biology degree to the test. She submitted a proposal to a student competition held by the Technion Center for Security Science and Technology (CSST). Her idea was to create a device that would detect when a soldier was about to fall asleep, winning her third place in the competition. The first-place prize was awarded to electrical engineering student Elinor Ginzburg B.S. '21 for technology based on programmed bacteria to treat wounded soldiers at the scene. Second place went to students Moshe Kimhi B.S.'20 and Ido Galil B.S. '20, M.S. '22 for their chip to prevent soldiers from being kidnapped.

The annual Student Competition for Security Developments, one of many CSST activities, was open to students in all faculties and aimed at encouraging creative ideas in the field of security and counterterrorism. But in a country where most students serve in the military, the top prizes all centered on keeping Israel's soldiers safe.

"Protecting the soldiers in the field is, in my view, the strongest mission in the field of security and counterterrorism," said Brigadier General (Res.) Professor Jacob Nagel, current head of the CSST and the Technion's Peter Munk Research Institute, and former national security advisor to Prime Minister Benjamin Netanyahu.

The CSST is an interdisciplinary center that supports breakthrough research for both the defense and civilian markets. With Prof. Nagel at the helm, the center is well connected to leading research bodies in academia and government alike. The students were recognized for their innovative proposals at the CSST's 16th annual conference at the Technion in late 2019. The event was attended by top scientists and executives from both the Ministry of Defense and Israel's leading defense company, Rafael, as well as Prof. Nagel, Technion President Uri Sivan, and other key Technion faculty. The winners received the opportunity to be mentored by Technion alumni

> The Technion not only gives me the tools to be an electrical engineer but helps me think creatively. Often we are asked to solve problems that are not necessarily related to the course, but we can answer them using knowledge from a range of subjects.
>
> **Elinor Ginzburg B.S. '21**

working in the tech industry, in addition to a small financial award.

"I never thought I'd see my name announced with the winners," said Elinor, delighted to take first prize. Her winning proposal was for a "biological dressing" that halts a soldier's internal bleeding and provides protection until he or she arrives at the hospital. The cutting-edge technology would be an injection containing programmed bacteria, which upon entering the bloodstream could detect the source of the internal bleeding and initiate a rapid coagulation process. The synthetically engineered bacteria will measure vital signs to hopefully eliminate or reduce the need for some of the routine initial tests conducted at the hospital.

It came as no surprise to Elinor that women comprised two of the three top-winning teams. "It's very common, at least in my world," she said. "I've met so many powerful and impressive women scientists, so I feel like the best proposal wins."

Though Elinor is a third-year student in electrical engineering, she was able to bridge the disciplines, thanks to the Technion's approach to problem-solving. "The Technion not only gives me the tools to be an electrical engineer but helps me think creatively," she said. "Often we are asked to solve problems that are not necessarily related to the course, but we can answer them using knowledge from a range of subjects."

Moshe and Ido, who are from electrical engineering and computer science, respectively, also dove into somewhat unchartered territory with a biomedical engineering proposal. The two took second prize for a proposed chip that would report a soldier's position and medical condition during operational activities, mainly for the purpose of preventing kidnappings. The small chip would contain sensors and be implanted under the skin, drawing some of its required energy from the body's heat.

"In my faculty, there are many options to take courses from biomedical engineering," said Moshe. "In addition, the T-hub innovation center encourages people from different faculties to collaborate. Interdisciplinary collaboration and problem solving are very much a part of the culture encouraged at the Technion."

Mor was still a biology student when she entered the CSST security competition in May 2019. She wasted no time getting to work on AWAKA, a noninvasive system to monitor wakefulness. It would work by using electroencephalogram (EEG) technology that scans the brain waves to detect when the soldier is about to fall asleep. The system would then use transcranial magnetic stimulation (TMS) technology to deliver a tiny electrical signal to the area of the brain that controls the sleep cycle, stimulating physiological alertness.

Commercial development of student ideas generally depends on the student's determination and ability to spend time on the project. One of last year's winners, for example, approached Prof. Nagel for help and is currently working with an Israeli company on his innovation. It seems that Mor won't be far behind.

Winning the CSST competition cemented her commitment to bring the idea to fruition. She hopes to attend medical school and then develop a prototype for the device that would be worn like a headphone under a soldier's helmet. "It's my baby," she said. "It's important for me to spread the word that sleep deprivation could cause harm and is not necessarily your fault." ■


Prof. Wendy Ju

JACOBS
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KEEPING IT HUMAN

Professor Wendy Ju studies ways to design autonomous machines that understand us

TECHNION IMPACT / THE LEADING EDGE OF OUR HIGH-TECH FUTURE

Videos of Professor Wendy Ju's experiments look like *Candid Camera* outtakes. In "The Ottoman Experiment," a normal-looking ottoman travels on its own across the room and stops in front of unsuspecting student subjects. And just like subjects on the 1960s hidden-camera TV show, their reactions are amusing: Some put up their feet; others pet it like a dog, and others look very confused. But that's the crux of Ju's work.

Her experiments in interaction design research aim to better understand human–robot interaction to help industry design and perfect autonomous vehicles and other machines. "The kind of work we do…brings up questions that you might not have thought of before," said Ju, assistant professor of information science at the Joan & Irwin Jacobs Technion-Cornell Institute at Cornell Tech and a faculty member at the Technion in Haifa. A partnership between the Technion and Cornell University, the Jacobs Institute is an innovative graduate program focused on bringing research to commercial applications through the collaboration of academia and industry.

Prof. Ju is using such questions to help automakers working on driverless cars. Before you step into the street while crossing an intersection, you usually make eye contact with the driver of the stopped car. Or so you think. Actually, most pedestrians look at the wheels and the bumpers of the car — not the driver, a fact revealed by "Ghost Driver," another of Prof. Ju's experiments. How pedestrians interact with a machine that doesn't have a human at its helm is essential to understanding how to design such vehicles.

"When we see the patterns of behavior around how people interact with machines, it helps to narrow what could happen and what is expected to happen. Machines need to be able to pick up on the range of things that people do and what the variations are," said Prof. Ju, who holds a master's from MIT and a Ph.D. from Stanford, and has worked with companies including Ford, Nissan, Renault, and Bosch.

The technology behind autonomous cars is similar to the automated flight systems used in airplanes. But people have been trained to use those systems. "People walking the street have not taken special training to interact with driverless cars," she said. "We are looking for what people naturally do before we design."

That will prove very important when it comes to driverless cars, which will have to make life-or-death decisions. And this doesn't apply to just cars. Robots alert staff to supermarket spills; trash cans tie their own bags; your local McDonald's may soon have robots "manning" the drive-through. And during a global pandemic, the benefits of food delivery robots are enormous, though much work remains to be done, as Prof. Ju said in a recent *Slate* article.

But designers haven't always considered how humans will respond to these automatons, or vice versa. Prof. Ju thinks the questions her research raises will make autonomous machines of the future more effective and safer, too. ■

William Dahl *(fourth from left)* **and Barbara Dahl** *(third from left)* **touring the Joan & Irwin Jacobs Technion-Cornell Institute at the Cornell Tech campus on Roosevelt Island in New York with friends and ATS staff members**

> It's amazing that this institution in a small city in the north of Israel can educate not just Israelis, but the world.
>
> | **Mrs. Barbara Dahl**

BUILDING A TECHNION COMMUNITY

in the Southeast

Education and Israel have been lifelong passions for American Technion Society (ATS) donors Barbara and William Dahl of Chapel Hill, N.C. Mrs. Dahl's grandfather, an ardent Zionist, brought 300 Jews over from Germany to a family-owned hosiery mill in Nashville, Tenn., in the 1930s, and served as president of the Zionist Organization of America for a period after World War II. He took 9-year-old Barbara to Israel in the summer of 1957. While there, she stayed with Golda Meir, and got to see Israel through the future prime minister's eyes.

Mrs. Dahl's parents first learned of the Technion through a cousin, who told them a gift to the Technion would truly help build the State of Israel. Her parents were so moved that they funded a trust, which on their deaths endowed a chair in chemical engineering at the Technion, the same field as her father's profession.

The couple's nearly 50-year marriage is interfaith — Mrs. Dahl is observant in the Reform Jewish community and Mr. Dahl is a devout Christian who entered the ministry as a second career. Both hold multiple degrees from institutions including Yale, Vassar, and Stanford. When it came to their own philanthropy, the Dahls wanted to invest in ways that supported their faiths, the Jewish people, and their commitment to education. "The future of any country lies in education," Mrs. Dahl said. It was only natural they supported an institution such as the Technion.

Their involvement started when they learned of the Joan & Irwin Jacobs Technion-Cornell Institute at the Cornell Tech campus on Roosevelt Island in New York. "I read about Mayor Bloomberg sending out an invitation to select institutions to build an applied sciences university and was amazed that the Technion beat out Stanford and other prestigious institutions around the world. The Jacobs Institute is something amazing happening right here in America, spurred on by Israeli entrepreneurship and inventiveness," said Mrs. Dahl. The Dahls support the Jacobs Institute with an annual gift for scholarships, and they love taking friends and family to Roosevelt Island to show off Technion ingenuity unfolding in New York City.

The Dahls have left a generous gift to the Technion in their estate plan. Building on Mrs. Dahl's background in psychology and medical research, and her father's struggle with Alzheimer's disease, they hope their gift will support further research in brain science and possibly fund an institute in that field.

ATS does not have an official presence in Chapel Hill, which is why Mr. and Mrs. Dahl work overtime to build a community of Technion supporters there and throughout the Southeast. Their dream is that everyone in the community, regardless of their religious background, will come to see the Technion the way they do: as a beacon of enlightenment that is making a tremendous difference for the world. ■

TECHNION INNOVATION

ADHD Cap

A new cap can safely treat attention-deficit/hyperactivity disorder (ADHD) without medication, through safe electrical charges to regions of the brain involved in ADHD behavior. *Developed by Innosphere, co-founded by Yousef Badran B.S. '12*

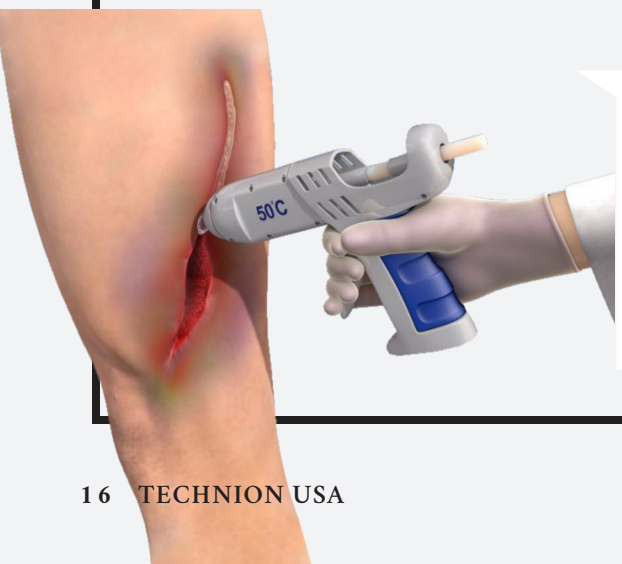
vayyar

X-Ray Vision

Vayyar "4D" sensors can see through human tissue, most human-made surfaces, and barriers such as smoke and steam using low-power radio wave technology. *Developed by Naftali Chayat, Technion alumnus*

Wireless, Electric Roads

ElectReon develops smart road technology that wirelessly charges electric cars, buses, and trucks. The technology, key to a driverless future, is being piloted in Israel and Sweden. *Developed by Oren Ezer M.S. '06*



Medical Hot-Glue Gun

A new device delivers an innovative flexible glue that can safely adhere torn human tissue together. The glue is safely absorbed into the body once tissues have healed. *Developed by Assoc. Prof. Boaz Mizrahi and doctoral student Alona Shagan*

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Electric Plane

The world's first electric planes could take to the skies as early as 2022. Eviation Aircraft has unveiled an emissions-free plane that will be environmentally friendly and inexpensive to operate. *Developed by Dekel Tzidon '95*

Water for Everyone

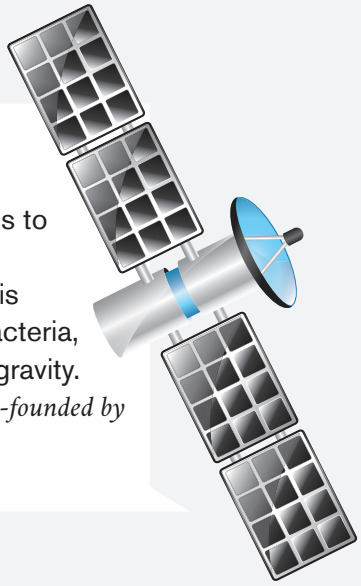
A new system produces water from the air, even in dry desert regions. The innovative system can provide water to smaller, poorer, and isolated communities more quickly. *Developed by Assoc. Profs. Eran Friedler and David Broday*

Cranial Surgery Patch

A post-cranial neurosurgery patch made of synthetic, biodegradable nanofibers protects the brain and spinal cord from infection, accelerates healing, and prevents cerebral spinal fluid from leaking. *Developed by Nora Nseir B.S. '09, M.S. '11*

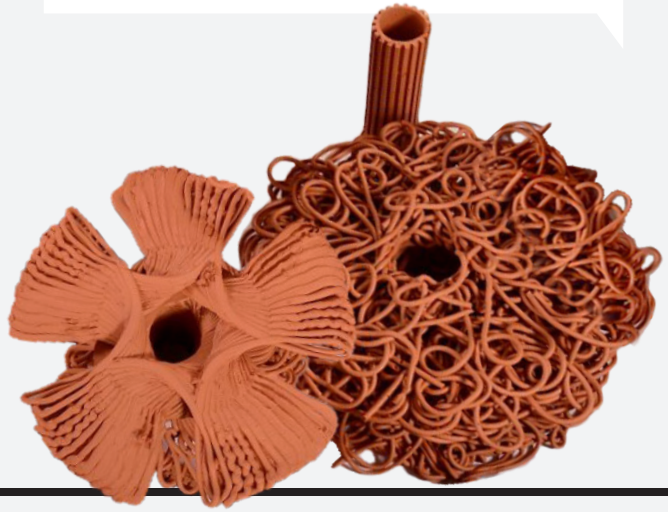
Mini-Labs in Space

Autonomous mini-labs will study the ability of enzymes to break up disease-causing bacterial residues. Space is the ideal place to study bacteria, which grow faster in zero gravity. *Developed by SpacePharma, co-founded by Ido Priel M.S. '11*



3D Plastic Coral Reefs

Some 40 species of fish are now sleeping, hiding, and laying eggs in the world's first 3D-printed bioplastics and ceramic reef in the Red Sea. These 3D reefs could be the key to rebuilding our oceans' dying coral reefs. *Developed by Prof. Ezri Tarazi*



Liquid Foam Therapy

Based on earlier research into breathing difficulties of preterm infants, the new therapy could dramatically improve the treatment of the of the highly fatal acute respiratory distress syndrome (ARDS) in COVID-19 patients by delivering medications via foam to improve the distribution across the lungs. *Developed by Assoc. Prof. Josué Sznitman*

*Some items pictured are mockups, prototypes, or similar innovations. Image credit to company/innovator's websites.

(L to R) **Prof. David Broday, Prof. Eran Friedler, Ilan Katz, and Liron Houber**

SOLVING THE WORLD'S WATER CRISIS

TECHNION IMPACT / INNOVATIONS FOR A GREENER WORLD

"Access to clean water is a lifeline. It enhances gender equality, gives opportunities, and basically gives hope. This was the motivation that drove us to develop moisture-harvesting systems that can be deployed in any remote community," said Associate Professor Eran Friedler of the Faculty of Civil and Environmental Engineering at the Technion.

Water is an essential. But accessing reliable, clean water is becoming more and more difficult in parts of the world. Already, 2.1 billion people worldwide don't have access to water, and 4.5 billion lack adequate sanitation.

This problem will only grow in the coming years. According to the World Health Organization, by 2025 about half of the world's population will live in areas facing water scarcity.

> Access to clean water is a lifeline. It enhances gender equality, gives opportunities, and basically gives hope.
>
> **| Prof. Eran Friedler**

Water from Air

Technion experts are working to rapidly solve the world's clean water crisis, finding innovative ways to bring water to those who don't have it, and to purify water to ensure water supplies are free from contaminants.

Prof. Friedler and Associate Professor David Broday, also 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.

There is humidity in the air all around us — even in the arid air of the Sahara Desert. This means that even the smallest, poorest, most isolated communities have access to

clean drinking water. They simply need the tools to collect it.

Systems for harvesting moisture from the air already exist. They are similar to domestic air conditioners that pull in air, cool it, and push out the cool air, discarding the moisture condensed during the cooling process. Moisture harvesting systems keep the condensed moisture and discard the cooled air instead.

However, this system is extremely inefficient and expensive. Profs. Broday and Friedler's prototyped system optimizes the process by separating moisture from the air before cooling it. This means energy is used only to cool the moisture itself and convert it into available water.

The new system also makes the water cleaner. Air can contain pollutants, dust, and disease-causing bacteria, making the resulting water pulled from that air polluted and contaminated, too.

In the Technion researchers' system, only the condensed water meets the cooling coils. Any contaminants from the air are absorbed into a saline-based desiccant, ensuring the water that is produced is pure and safe to drink right away.

Profs. Broday and Friedler have built a prototype and are already performing simulations to see how the system would function in different climatic and humidity conditions.

"We wanted to see whether the system can be used in areas where the air is arid," said Prof. Broday. "For example, in the Sahara Desert and in Yemen, which is currently experiencing a severe hunger crisis and lack of drinking water." The system is particularly useful for small and isolated communities that are located far from water sources, as it can produce water where it is most needed.

Combating Oil Pollution

Oil is one of the world's most common pollutants, and can be found in almost every ecosystem. Oil makes it more difficult for soil to absorb water, and oil-contaminated water and soil can cause a variety of health problems in humans, from skin irritations to liver and kidney damage. Yet removing oil pollution is expensive, harmful to the environment, and often ineffective.

Visiting Professor Shai Kendler of the Faculty of Civil and Environmental Engineering has found an alternative using remote sensing technology.

When solar radiation hits physical objects on Earth, the objects absorb and reflect different amounts of solar radiation back. Satellite sensors can detect how much radiation is reflected back from those objects, creating a unique "fingerprint" for each object based on the wavelength and frequency of solar radiation that is reflected. Through this process, a satellite can distinguish between soil, water, and pollutants.

"Rocks and soil, for example, are objects which have a color that is strong and distinct," Prof. Kendler explained. "In contrast, pollutants are often shown as thin and permeable layers."

Prof. Kendler has developed an algorithm that can quickly identify the type of pollutant present in soil or vegetation, turning a mountain of data available from satellite imagery into a map of areas impacted by oil pollution. The algorithm can detect and specify the chemical properties of a pollutant as well as where the pollutant is located down to the pixel, allowing experts on the ground to know exactly where pollutants are hiding.

Prof. Kendler's algorithm has other potential applications as well, including identifying anthrax inside paper envelopes.

Keeping Our Water Clean

Assistant Professor Adi Radian of the Faculty of Civil and Environmental Engineering has developed an innovative, patented technology to purify water from the pollutant formaldehyde. Formaldehyde is a carcinogen that is used to manufacture glue and therefore common in the wood, paper, and textile industries, where it accumulates in the water used for production.

The challenge with removing formaldehyde from our water is that it is present in such low concentrations that typical methods for removing contaminants from water are ineffective. This, coupled with the deadly side effects of formaldehyde, make it one of the most problematic pollutants in our environment.

Prof. Radian's team has adapted montmorillonite clay to enable it to absorb formaldehyde and reduce its concentration. They then attach bacteria that breaks down formaldehyde to the clay. After each cycle of formaldehyde decomposition, the clay cleans itself for another round. Prof. Radian believes the adapted clay may be able to absorb and degrade other pesticides that threaten to contaminate groundwater, too.

These Technion innovations go a long way toward making sure there is clean water for all. ■

Technion Lab Out to Show that

MEDICAL CANNABIS

ISN'T ONE-SIZE-FITS-ALL

TECHNION IMPACT / MEDICAL ADVANCES THAT SAVE LIVES

A few years ago, Israel started treating severely autistic children with medical marijuana. The results were startling. Many children slept peacefully throughout the night for the first time in their lives, made eye contact, or uttered their first words. Then suddenly, some children inexplicably demonstrated self-abusive and other regressive behaviors.

What happened? It turned out that the cannabis grower changed greenhouses. Physicians thought they were prescribing the same medicine, but the new plant was as different as penicillin is from tetracycline. "Cannabis is a generic name," said Professor Dedi Meiri, the Technion's cannabis expert. "It's not enough to say, 'Take two and this will help.'"

Prof. Meiri is on a mission. He aims to understand the cannabis plant so thoroughly that a physician knows exactly what is in the medicine in order to repeat a prescription with precision. Medical marijuana with a high percentage of CBD, the non-psychoactive part of the plant, for example, is usually beneficial for reducing seizures. But recently, Prof. Meiri found some strains with high CBD that worsen seizures. "How can we repeat a successful treatment if we don't know its active compounds? We are not blind anymore," he said.

Prof. Meiri's Laboratory of Cancer Biology and Cannabinoid Research in the Faculty of Biology is the largest of its kind in academia, with 44 researchers developing methods for analyzing the active compounds in over 900 different types of cannabis plants. He works with cannabis growers to identify almost every strain of marijuana grown in Israel, with the goal of matching specific strains to the diseases each affects. "When we started to work with cannabis in the lab, we found that cannabis #1 could kill colon cancer cells but did nothing for prostate cancer, while cannabis #2 killed prostate cancer but didn't affect colon cancer," he said.

Today, his lab has teams of researchers devoted to studying the effects of cannabis on cancer, neurodegenerative diseases including Alzheimer's, and immunological diseases such as multiple sclerosis. They have eight clinical trials underway, as well as preclinical trials with mice. They are also preparing to start clinical trials on leukemia patients, for whom their research is furthest along. They already understand the mechanisms by which the cannabis affects the leukemia cells in bone marrow. "Our clinical trials will focus on kids where traditional medicine is not working, and on adults whose success rate is low," he said.

In addition, Prof. Meiri's Technion scientists are studying our body's naturally occurring endocannabinoids, which bind to the same receptors as cannabis. They are also building exhaustive databases that profile the compounds taken by Israel's 60,000 medical marijuana patients, and identify treatments according to patient-class specifics. The databases will be accessible online to provide recommendations for the most suitable, safe, and effective cannabis treatment.

This is a far cry from when Prof. Meiri started working with cannabis in 2015. "We were quite alone, like pioneers in the desert," he recalled. "Today, everybody is talking about cannabis." ■

ALZHEIMER'S AND PARKINSON'S

NEW STRATEGIES NEW HOPE

TECHNION IMPACT / MEDICAL ADVANCES THAT SAVE LIVES

Virtually everyone has been impacted by either Alzheimer's or Parkinson's disease. Watching as a beloved grandparent or friend experiences cognitive decline is heartbreaking. And as the number of older Americans grows, so too will the number of cases. Americans with Alzheimer's are slated to rise from about 5.8 million people today to 13.8 million by midcentury, while the number of Americans age 45 or older with Parkinson's is forecasted to jump from about 930,000 today to 1,238,000 in a decade.

Technion researchers are on the front lines battling both degenerative diseases. Associate Professor Ester Segal, who often speaks with American Technion Society supporters, along with her Ph.D. student Michal Rosenberg in the Technion Faculty of Biotechnology and Food Engineering, and scientists from Bar-Ilan University, are studying a novel approach to treatment.

Conducted with the support of the Russell Berrie Nanotechnology Institute at the Technion and tested in mice, their approach hinges on a probable cause of Alzheimer's: the accumulation of the protein amyloid beta, which blocks and kills neurons and damages motor function. Existing research suggests that treating Alzheimer's patients with another protein, neural growth factor, can inhibit the disease's progression. But there is a real barrier to success: the "blood–brain barrier," a filtering mechanism that restricts drugs' passage from bloodstream to brain.

As a work-around, Prof. Segal and her team have developed a nanoscale silicon chip with a porous structure that can carry large amounts of neural growth factor. Measuring just 2 millimeters on each side and 10 microns thick, the chip is small enough to get through the blood–brain barrier. And consisting of 70% holes, it acts like a sponge that can be tailored to carry the neural growth factor, releasing it over a span of a month to the target brain region. After doing so, the chips safely dissolve.

The Segal team has described two methods of chip delivery: either implanting it into the tissue surrounding the brain or injecting it via a gene gun. Developed for a separate purpose, the gene gun was reworked by Bar-Ilan Associate Professor Orit Shefi into a spray that can propel the chip into the brain through the nose, avoiding the blood–brain barrier. Experiments so far have been restricted to animals and are ongoing.

"Dozens of people from all over the world have contacted us since the publication of our work," said Prof. Segal. "I was devastated from some of their stories and the depression of early-diagnosed Alzheimer's patients and their families."

The Technion has a notable history in neurodegenerative research. Professor Emeritus Moussa Youdim co-created the first anti-Parkinson's drug, rasagiline, now marketed as Azilect. Other Technion researchers are following suit. Associate Professor Simone Engelender, for example, has posited a new theory that better accounts for the progression of Parkinson's symptoms than the conventional model.

Although clinical studies enrolling Alzheimer's and Parkinson's patients are required to gauge the long-term significance of Technion research, the advances that Prof. Segal and others are making provide solid hope for an improved standard of care for both nefarious diseases. ■

Innovations from Technion Labs:
FROM RESEARCH TO THE MARKETPLACE

TECHNION IMPACT / THE KEY TO ISRAEL'S PROSPERITY

Walk through any of the Technion's campuses, and you'll find dozens and dozens of faculty members dedicated to research projects that push the boundaries of their fields.

The Technion is committed to making sure research that can change the world reaches consumers as quickly as possible.

Technion Technology Transfer (T3) is the unit that identifies the most promising research and helps bring it from the lab to the marketplace. T3 helped commercialize a drug for early-stage Parkinson's, known as Azilect to consumers. And the new Innovation and Entrepreneurship Center, or T-Hub, serves as an umbrella for entrepreneurial ventures that encourage students and faculty members to think bigger and bolder about how their research can be applied.

It's no wonder 2019 was a record-breaking year for Israel's economy. Thanks to the Technion's efforts to nurture entrepreneurs and bring their research to life, Israel is seeing more venture capital revenue, more exports, and double the number of "unicorn" businesses — privately held companies with a valuation of $1 billion or more.

Here are just a few of the researchers and breakthroughs powering this economic revolution:

Professor Marcelle Machluf and NanoGhosts

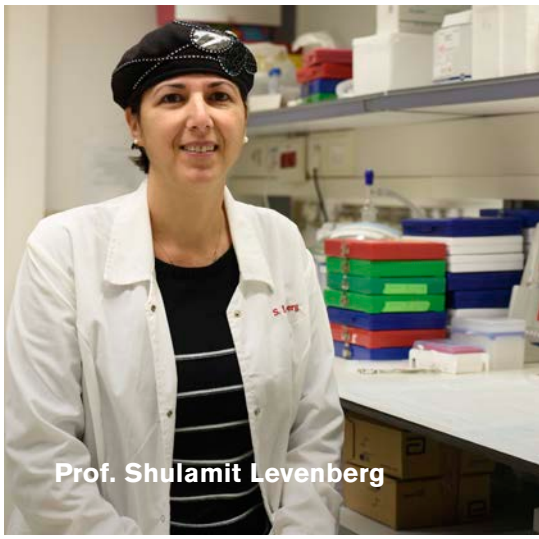
Shrinking tumors from within

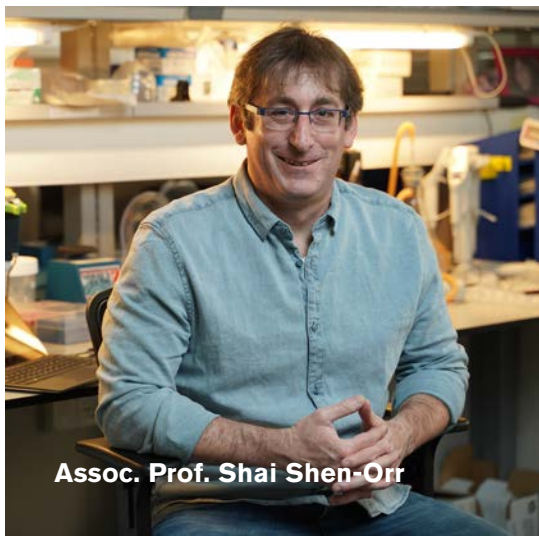
The dean of the Faculty of Biotechnology and Food Engineering at the Technion, Prof. Machluf launched her own startup earlier this year to market what she calls NanoGhosts.

Despite medical advances, brain tumors — particularly those originating from metastatic melanoma — have a grim prognosis for patients. Experts have long struggled with how to deliver therapeutic agents safely to the brain.

Prof. Machluf has created a novel targeted drug carrier, made from the outer membrane of human mesenchymal stem cells. These stem cells have been found to stick to cancerous cells and help them hide from the immune system, enabling tumor cells to grow unchecked. By emptying these stem cells of their


Prof. Marcelle Machluf


Prof. Shulamit Levenberg


Assoc. Prof. Shai Shen-Orr


Prof. Gideon Grader, doctoral candidate Avigail Landman, and Prof. Avner Rothschild




content, rendering them "ghosts," shrinking, and loading the new nanosized cell membrane with cancer-fighting drugs, these cells can be injected into the bloodstream. From there, they merge with the tumor, delivering medication that kills cancerous cells from within.

Animal trials of NanoGhosts have been extremely impressive thus far. One injection led to an 80% to 85% reduction in tumor size. Prof. Machluf is adapting NanoGhosts to pass the blood–brain barrier and has started to look at the technology for possible use in lessening the level of infection in COVID-19 patients.

Two years ago, the Israel Science and Technology Ministry named Prof. Machluf's research as one of Israel's 60 most impactful developments.

Professor Shulamit Levenberg and Aleph Farms

Lab-grown meat that tastes like the real thing

Prof. Levenberg, dean of the Faculty of Biomedical Engineering and the Stanley and Sylvia Shirvan Chair in Cancer and Life Sciences, used her expertise in tissue engineering to develop an innovative solution to the looming food crisis: real steak grown from cow cells that avoids killing animals and significantly reduces the impact on the environment.

Her lab-grown meat begins with isolating the cells responsible for regenerating and building muscle tissues in cows. Prof. Levenberg then uses a proprietary 3D platform to grow the cells and develop a beef product that is close in taste, texture, and structure to the real thing.

Unlike meat substitutes that are plant-based, Prof. Levenberg's meat comes from beef cells — just with a dramatically lower environmental and more humane footprint. And because the meat is grown in the lab, there's no need for antibiotics, reducing the risk of foodborne illnesses.

This research has been developed into the highly successful startup Aleph Farms, where Prof. Levenberg serves as the company's chief scientific officer. Last year, it raised nearly $12 million in financing to expand its work even further.

Associate Professor Shai Shen-Orr and CytoReason

Big data meets biology

Many drugs tested successfully on mice fail in human clinical trials. And even when clinical trials are successful, they can be extremely lengthy and expensive. Prof. Shen-Orr, head of the Technion's Systems Immunology and Precision Medicine Lab, has a solution.

By bringing together big data with biology, Prof. Shen-Orr is able to predict how an individual will react to a particular drug and develop a personalized medication. CytoReason is the world's first and only machine-learning platform that can map someone's immune system at the cellular level and understand how they will react to different diseases — and treatments.

CytoReason could revolutionize cancer immunotherapy as well as autoimmune, neurodegenerative, and infectious disease research by making research more efficient and delivering more personalized treatments. Prof. Shen-Orr and CytoReason are currently collaborating with top global pharmaceutical companies like GlaxoSmithKline and Pfizer, as well as the U.S.-based Parker Institute for Cancer Immunotherapy.

Prof. Shen-Orr has also developed a way to gauge an individual's "immune age" — a more accurate measure of health than chronological age that can better pinpoint one's risk for infection and chronic diseases such as cancer and heart disease.

Professors Gideon Grader and Avner Rothschild with Dr. Hen Dotan and doctoral candidate Avigail Landman: H2Pro

Greener, efficient energy

Technion researchers at the Nancy and Stephen Grand Technion Energy Program have developed a new hydrogen production technology that is greener and would improve production efficiency from 75% to 98.7% as compared with hydrogen production from natural gas.

Most hydrogen produced today is used in fertilizers and refineries. But as the world moves toward cleaner power sources, hydrogen will play a huge role as a renewable energy source for powering our electric cars and heating our homes.

The Technion team's technology uses electrochemical–thermally activated chemical (E-TAC) water splitting to generate hydrogen. E-TAC decouples the hydrogen molecules from the oxygen molecules. Since the process happens through a spontaneous chemical reaction rather than an electrical current, the process is much more energy efficient. It's cheaper, too: Researchers expect the cost of equipment to produce hydrogen through E-TAC will be about half of that used in existing technologies.

H2Pro was created to commercialize this innovative hydrogen production technology. The company was given an exclusive license by the Technion to commercialize the product and to date has raised nearly $5 million in a campaign led by Hyundai. ■

Technion Students
PAYING IT FORWARD

TECHNION IMPACT / SHAPING THE FUTURE OF ISRAEL'S SOCIETY

"I grew up mostly with my mom, mostly learning how to survive. I got an education at home, but I also got an education with my friends," said Sean Meir, an undergraduate student in the Technion's Henry and Marilyn Taub Faculty of Computer Science who expects to graduate in May 2020. "They did horrible stuff, stuff that I'm not proud of. Most of them have criminal records." Meir grew up in Nof HaGalil, an underserved community in Israel's periphery.

His life could have taken a different trajectory, one similar to his childhood friends', but he was given a second chance through the Technion's Center for Pre-University Education. He shared his story with American Technion Society (ATS) supporters during a speaking tour in the U.S. with fellow students, including Neta Blum.

Blum's life couldn't have been more different. She grew up in suburban Maryland, the daughter of a cardiologist and Technion grad himself. Returning to Israel at age 17, Blum attended the Brakim excellence program, a joint initiative of the Technion and Israel Defense Forces (IDF) that combines a Technion education, bachelor's and master's degrees in mechanical engineering in only four years, with military service. Today, she is carving out a career in academia as a Technion Ph.D. student in the Faculty of Aerospace Engineering and conducting R&D in the Israeli Ministry of Defense. Her work just earned her a place on *Forbes Israel*'s "30 Under 30" list, marking her as a young influential leader who will change the future.

Despite their different upbringings, Blum and Meir share a commonality: Technion programs have afforded them opportunities to transform their lives for the better. Now they're paying it forward by inspiring and mentoring the next generation of Technion students.

For Meir, being recruited to the Technion's pre-university program as he finished his military service was the chance of a lifetime. The rigorous program is aimed at helping students from underprivileged or nontraditional backgrounds gain the academic foundation they need to succeed at the Technion. Israel's first Haredi-educated doctor, Yehuda Sabiner, is one of the many notable graduates of the program.

After one semester of high grades in the Faculty of Math, he was able to transfer to the more challenging Faculty of Computer Science. Meir's experience at the Technion has inspired him to launch his own startup after graduation.

"Attending the Technion is a life-changing experience. When you grow up in a neighborhood like I grew up in, you think that the Technion is not for people like us," said Meir. He is helping to change that, one conversation at a time.

Once a month, he goes back to Nof HaGalil to talk to kids who think, like he once had, that the Technion isn't for them. He also speaks to young soldiers about to be discharged from the army and encourages them to think about the Technion as they plan for their post-IDF futures.

In addition, Meir joined the Technion Student Association (TSA) to give back to the pre-academic program that helped him so much. Today, he serves as the program's academic coordinator, helping students with social, academic, and administrative issues.

Graduating from Brakim allowed Blum to choose from some of the best leadership positions in the IDF. She's now the head of the aviation technology department at the Ministry of Defense's Directorate of Defense Research and Development, earning the distinction as the first woman and youngest person ever in this position.

Alongside her demanding work with the Ministry of Defense, she is finishing her Ph.D. research 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.

Sean Meir B.S. '20 and Neta Blum B.S. '14, M.S. '18, Ph.D. '22

> Every day through my research and service, I wake up knowing that I am doing something for a bigger cause. I know what I am doing is helping Israel. And the Technion is a big part of that.
>
> | Neta Blum

She's also 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. She is determined to change that. 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.

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

Blum and Meir are shaping Israel's future through their academic and professional contributions — as well as volunteering to mentor the next generation of Israeli scholars and leaders. It's a story that is quintessentially the Technion, and it is happening every day across campus. ■

Community Is IMMUNITY

All Hands on Deck

When the pandemic reached Israel, Technion students took action. The Technion Student Association (TSA) mobilized hundreds of students to minimize the human cost of COVID-19. While coping with a rigorous academic workload, student volunteers are eagerly contributing their time and skills to help those most affected by the crisis.

In late February, the TSA stepped up to support approximately 15 students self-quarantined in their dorms — and hasn't looked back. The organization has helped students manage the move to online courses and has reached out to the broader community. Working closely with Haifa's Welfare Department, Technion students are calling and delivering meals to self-isolating senior citizens.

Technion students are also donating computers to Haifa's schoolchildren so they can pursue their education remotely. "As Technion students, we understand the importance of education and we want to ensure everyone has equal opportunity," said TSA Chair Linoy Nagar Shaul '21.

Technion medical students have also jumped on board by providing child care for health care workers, and helping clinics with triage and administering COVID-19 tests.

In the midst of the catastrophe, Technion students have shown how this cloud has a silver lining. ■

Faculty in the NEWS

Yaron Fuchs

TECHNION IMPACT / MEDICAL ADVANCES THAT SAVE LIVES

Just 10 years removed from graduate school, Assistant Professor Yaron Fuchs is making a name for himself in stem cell research and regenerative medicine. In 2019, he became Israel's first scientist to win a prestigious Grand Prize for his discoveries and groundbreaking work from the American Association for the Advancement of Science.

Now, he's won the Krill Prize for Excellence in Scientific Research and the Science Grand Prize for his work on apoptosis, a form of programmed cell death. He is one of the first researchers to turn that focus to stem cells, which are thought to have unlimited potential for self-renewal and differentiation. By better understanding the mechanisms for stem cell suicide, Prof. Fuchs has paved the way for novel strategies in tissue regeneration — even regrowing organs.

In a special webinar hosted by the American Technion Society this past spring, Prof. Fuchs spoke about the implications of cell death in containing the coronavirus. *To view upcoming events or recordings of past webinars, visit ats.org/events.* ■

Ester Segal

TECHNION IMPACT / MEDICAL ADVANCES THAT SAVE LIVES

Professor Ester Segal heads the Laboratory of Multifunctional Nanomaterials at the Technion. She also leads NanoPack, an EU consortium of 18 industrial and research institutes developing antimicrobial food packaging solutions using natural nanomaterials and essential oils to extend food's shelf life.

NanoPack materials can, for example, inhibit mold growth in bread for three weeks and expand the shelf life of yellow cheeses by 50%. This will dramatically reduce food waste, prevent foodborne illnesses, and reduce the amount of preservatives in our foods. NanoPack was one of four finalists in the Resource Efficiency category of the Packaging Europe Sustainability Awards in 2018.

Prof. Segal has also developed nanoscale silicon chips that could be safely implanted into the brain to inhibit the development of Alzheimer's disease. *See page 21 for more about Prof. Segal's tremendous discovery.* ■

Moti Segev

TECHNION IMPACT / THE LEADING EDGE OF OUR HIGH-TECH FUTURE

Distinguished Professor Mordechai (Moti) Segev is a world-renowned physicist in the field of optics and lasers. The Robert J. Shillman Distinguished Professor of Physics is one of the founders of the Helen Diller Center for Quantum Science, Matter and Engineering.

In 2018, two teams of Technion scientists led by Prof. Segev discovered a new scientific field: quantum metamaterials. Metamaterials are artificially created materials that respond to light in different ways. Previously, experimentation with metamaterials was limited to manipulations with classical light. In doing so, Prof. Segev has opened the door for numerous practical applications, including developing unbreakable encryptions to ward off cyberattacks.

Most recently, he was awarded the 2019 EMET Prize in the Exact Sciences — known as Israel's Nobel Prize — for his groundbreaking achievements in nonlinear optics, including his pioneering experiments on two-dimensional solitons and his demonstration of the first photonic topological insulators. ■

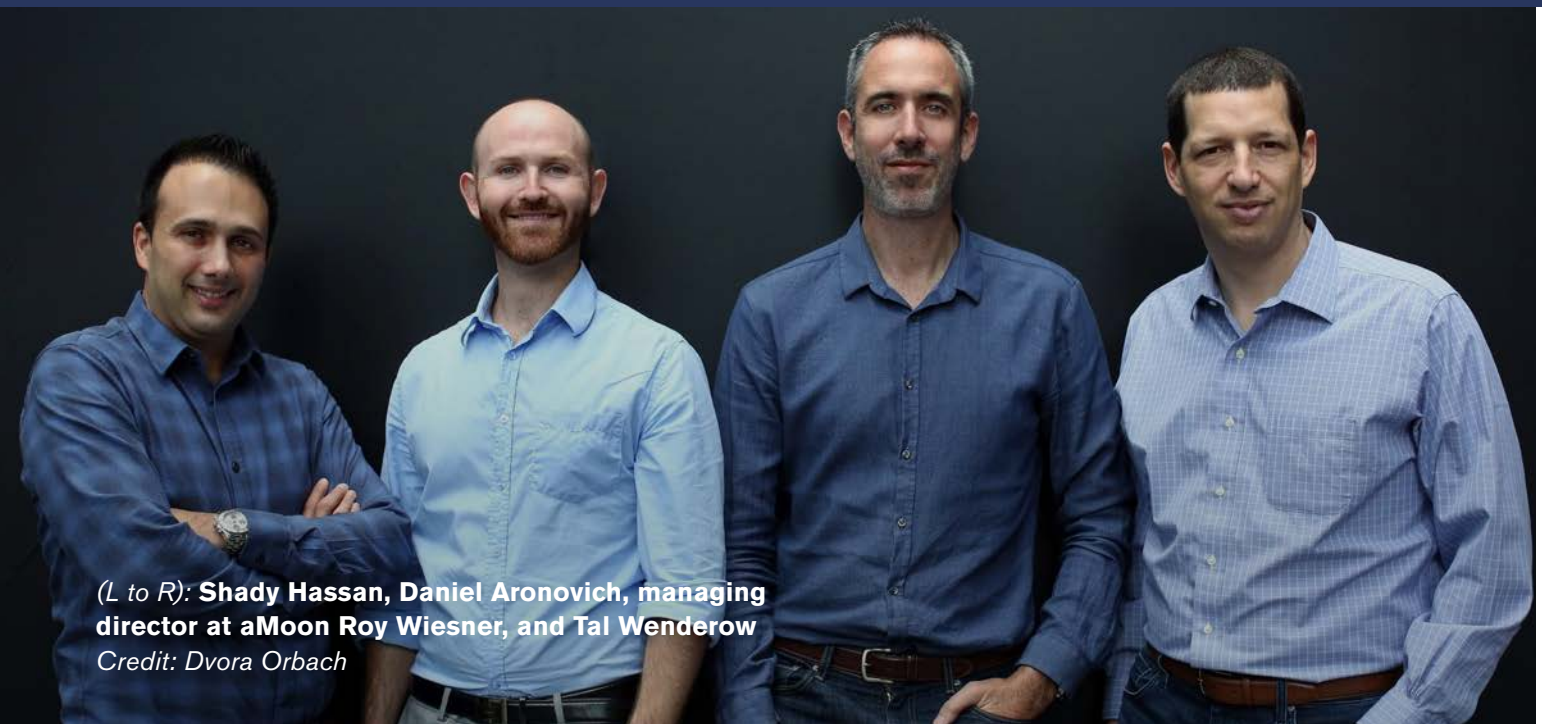
Roy Kishony

TECHNION IMPACT / MEDICAL ADVANCES THAT SAVE LIVES

Last summer, Professor Roy Kishony, director of the Technion's Lorry I. Lokey Interdisciplinary Center for Life Sciences and Engineering, discovered that the efficacy of an antibiotic cocktail is dependent on how many types of strains it is made up of, as well as the dosage of the combined strain. The new system could be used to find the most effective antibiotic combinations and allow for personalized treatment plans.

Also, through a joint project with Boston Children's Hospital, Prof. Kishony, who holds the Henry and Marilyn Taub Chair in Life Sciences, discovered that the risks of probiotics might outweigh the benefits. Using innovative genomic tools, he found that in some cases, probiotics caused blood infections in patients in the hospital's intensive care unit, and might have triggered the growth of antibiotic-resistant bacteria.

And researchers in Prof. Kishony's lab, with scientists at Rambam Health Care Campus, have successfully tested a method that will dramatically increase the current COVID-19 testing capacity using existing resources. Known as "pooling," this method enables simultaneous testing of dozens of samples. *See page 10.* ■



(L to R): **Shady Hassan, Daniel Aronovich, managing director at aMoon Roy Wiesner, and Tal Wenderow**
Credit: Dvora Orbach

NOTABLE TECHNION ALUMNI:

WHERE ARE THEY NOW?

TECHNION IMPACT / THE KEY TO ISRAEL'S PROSPERITY

Since its first class in 1924, the Technion has graduated over 111,000 alumni. Today, more than 70% are employed in the high-tech sectors that drive Israel's economic growth, helping to build the country's reputation as the Start-Up Nation. These brilliant alumni are working for multinational giants, shattering glass ceilings, moving stock markets, and creating technologies that benefit mankind.

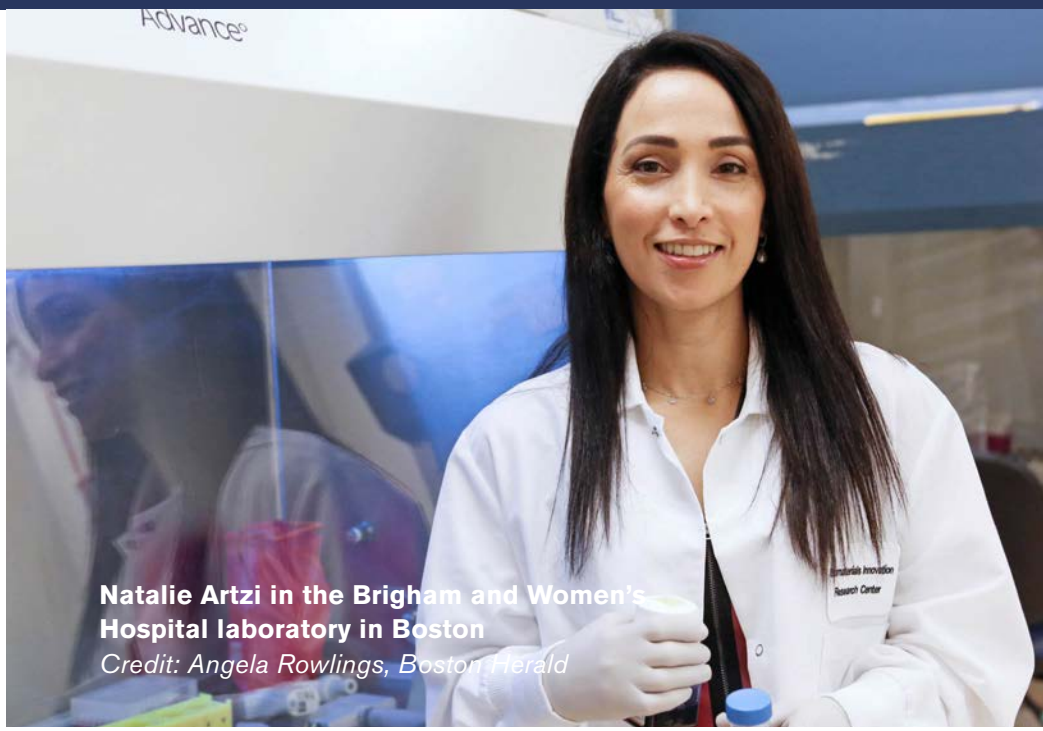
Tal Wenderow B.S. '01, Dr. Shady Hassan MD '06, and Daniel Aronovich B.S. '09, M.S. '13, Ph.D. '16 are tackling the coronavirus with voice analytics startup Vocalis Health. The grads are conducting research to identify a specific biomarker, or vocal fingerprint, unique to those infected with the novel coronavirus. They are working with the Israeli Ministry of Defense to collect voice and breath samples from COVID-19 patients and the general public for analyses using machine-learning technology. Vocalis' proprietary algorithm will help Israel's Ministry of Health flag patients carrying the virus and monitor their condition. Vocalis, profiled in a May 2020 article of The New York Times, hopes to have initial results by summer 2020.

The company is the product of the 2019 merger of Healthymize, a system to detect voice-affected diseases, and Beyond Verbal. Wenderow, president and CEO of Vocalis, led Beyond Verbal and helped the Technion and Rambam Health Care launch Corindus Vascular Robotics. Dr. Hassan, Vocalis' chief operating and medical officer, earned his medical degree at the Technion and served as a physician before co-founding Healthymize in 2015. Aronovich, CTO, was a physicist at Microsoft and Intel.

Natalie Artzi B.S. '97, Ph.D. '04, Chemical Engineering, is an accomplished academic and emerging entrepreneur. She serves as the principal research scientist at the Institute for Medical Engineering and Science at MIT, assistant professor at Brigham and Women's Hospital at Harvard Medical School, and associate member of the Broad Institute of Harvard and MIT. She also has launched BioDevek to develop her pioneering surgical and topical adhesives.

Professor Artzi's research aims to integrate science, engineering, and medicine to rationally design personalized materials with applications for treating cancer and gastrointestinal diseases. In November 2019, she won Brigham and Women's BRIght Futures Prize to advance an adhesive hydrogel that uses immuno-active nanoparticles to detect and kill brain cancer — a project inspired by a family friend diagnosed with brain

cancer at age 13. As a winner of the 2019–20 MIT-Israel Zuckerman STEM Fund, she is collaborating with Technion Professor Haim Azhari of the Faculty of Biomedical Engineering on her research combating brain tumors. Prof. Artzi spoke at an American Technion Society alumni event last year.



Natalie Artzi in the Brigham and Women's Hospital laboratory in Boston
Credit: Angela Rowlings, Boston Herald

Yoelle Maarek Ph.D. '89, Computer Science, a world leader in web search, sports a CV that reads like a who's who of brand-name tech companies. Currently, she is a vice president at Amazon, heading research for Alexa Shopping. Maarek started with IBM Research in the U.S. and Israel, where she held a number of positions, eventually leading the Search and Collaboration Department as an IBM Distinguished Engineer. In 2006, she made Google history as its first hire in Israel, where she opened and directed the Google Haifa Engineering Center. Her team notably launched the Google query service "Suggest." Maarek then became vice president of research at Yahoo!, guiding the multinational giant's research teams worldwide.

In 2014, Maarek made *Forbes* magazine's "50 Most Powerful Women in Israel." She has published more than 80 research articles, has served in various senior roles at leading academic research conferences, and is a member of the Technion Board of Governors.

Avigdor Willenz B.S., Electrical Engineering, lays claim to one of the biggest tech exits in Israel's history with his 2000 sale of the communications chip company Galileo Technologies to Marvell Technology Group for $2.7 billion. A prolific angel investor and one of Israel's most successful semiconductor entrepreneurs, Willenz served as CEO of Annapurna Labs, and sold the company to Amazon in 2015 for $370 million. The sale was Amazon's first major investment in Israeli tech. A year later, Willenz sold Leaba Semiconductor to Cisco, and in December 2019, he sold AI chip-maker Habana Labs to Intel for $2 billion.

Willenz has a two-pronged investment strategy: He invests in companies brought to him by other entrepreneurs, while also launching startups based on technologies he wants to bring to fruition. ■

WHAT'S NEW AT THE JACOBS INSTITUTE

In 2011, the administration of New York City Mayor Michael Bloomberg selected the Technion and Cornell University to build a first-of-its-kind campus with a bold vision: to become a national center for tech innovation. That center became the Joan & Irwin Jacobs Technion-Cornell Institute.

Its academic curriculum is designed around interdisciplinary hubs that began in the fields of connective media and health tech. **This fall, the Jacobs Institute is launching its third two-year master's degree program, in urban tech.** The new hub is aimed at making cities more livable, adaptable, and connected. It will allow students to pursue sectors such as real estate/proptech and intelligent buildings. American Technion Society supporter Mitchell Julis, a member of the Jacobs Institute Steering Committee, funded initial planning for the hub.

Key to innovation at the Jacobs Institute is the Runway Startup Postdoc Program. Part business school, part incubator, it has nurtured 28 startups since 2014. One such alumna-founded company, Biotia, is developing a test that will provide a closer look at SARS-CoV-2 and could be used for tracking as the virus evolves over time. Biotia also has the first certified lab in Brooklyn, N.Y., for coronavirus testing. It's only a matter of time until we see even more innovative startups like Biotia transforming our urban spaces. ■

The American Technion Society in Your

COMMUNITY

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1 The ATS – Miami Leadership Council at its annual season opening program.

2 A Technion alumni event at Microsoft – Silicon Valley, "From Startups to Established Companies: How Innovative Ideas Leads to Success," where alumni panelists Jenny Shalev (ThinkUP), Omer Davidi (BeeHero), Yuval Bachar (Microsoft), and Jacques Benkoski (U.S. Venture Partners) shared challenges, motivations, and success stories.

3 Brigadier General (Res.) Prof. Jacob Nagel, ATS – San Francisco Board Members, and Technion alumni Liat Portal and Yaron Hadad at a lunch and learn program hosted by Nixon Peabody.

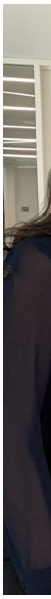
4 Attendees of the ATS – New York Metro "Wonder Women: The Technion Impact" event with ATS CEO Michael Waxman-Lenz.

5 ATS – Philadelphia hosted Technion students Chen Tubul and Rina Tzipora Ben-El for a reception at the Bluestone Country Club. The students spoke about their academic pursuits, student and campus life, and career aspirations.

6 The ATS – Southern California Board with Assoc. Prof. Itamar Kahn, keynote speaker at their "Autism to Alzheimer's: Innovative Methods for Tackling Neurological and Neurodegenerative Disorders" Rel-Event.

7 ATS Planned Giving Committee members with 2019 Annual Federal Tax Breakfast featured speakers — a Chicago event that attracts more than 150 professionals each year.

8 ATS – Washington, D.C. Leadership Council President Janet Shatz Snyder, during an event with Yehuda Sabiner B.S. '16, MD '19.

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AMERICAN
TECHNION
SOCIETY
ISRAEL'S
TOMORROW
The Technion plays a critical role in keeping Israel safe from those who would do it harm, training its future leaders, and encouraging diversity for all.
From VISIONARY EDUCATION
to a WORLD of IMPACT
4


TECHNION
ISRAEL INSTITUTE of TECHNOLOGY
5


6


Will Washington Begin Taxing Wealth?
7


8

LIVE FROM TECHNION

Webinars With Technion Experts

Prof. Uri Lesmes

Live From Technion: Webinars With Technion Experts is a series designed to help inform and inspire our community. Hear about the great research that's coming out of the Technion, strengthening Israel, and changing the world.

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