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מכון ויצמן למדע
WEIZMANN INSTITUTE OF SCIENCE

# THE WEIZMANN

INTERNATIONAL MAGAZINE OF SCIENCE & PEOPLE No. 8

18 Reaping the benefits of plant research
Advancing food security in an insecure era

12 René and Susanne Braginsky are sculpting science

26 The Schwartz-Reisman Science Education Centers


## Credits

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# From the President

Dear Friends,

I'd like to start off by sharing with you some excellent news that emerged over the summer and which will surely buoy us into the new academic year: The Weizmann Institute was ranked 10th in the world for research quality in the highly regarded Leiden University ranking. The survey is based on citation data of published papers, which reflects the quality of the papers—essentially, their impact. *(See full story, p. 43)* This rank reflects a significant rise in the impact of Weizmann Institute of Science research. It means that what we are doing here is being noticed, and matters greatly in the global enterprise that is modern science.

I want to congratulate all our scientists and our community of friends worldwide whose hard work and commitment led to this wonderful result in which we can collectively take pride.

The cover story for this issue is about food security—the supply of food, its quality, and people's access to it. This is one of the areas in which our scientists have been hard at work since the very earliest days of the Institute; after all, Israel's original economy was an agricultural one. And what better place from which to tell this story than here in Rehovot, which was once the epicenter of Israel's Jaffa Orange industry and is now an epicenter of the next evolution in its economy: science and high-tech. Weizmann Institute plant scientists have made some interesting and important discoveries in this area which are indeed contributing to making our food supply more secure.

As always, you'll read about, and undoubtedly be impressed by, some of the new scientists who recently joined our ranks; as well as several close friends of the Institute—generous philanthropists whose personalities and commitment to the Institute come through vividly on these pages.

With all best wishes,
**Prof. Daniel Zajfman**
President, Weizmann Institute of Science

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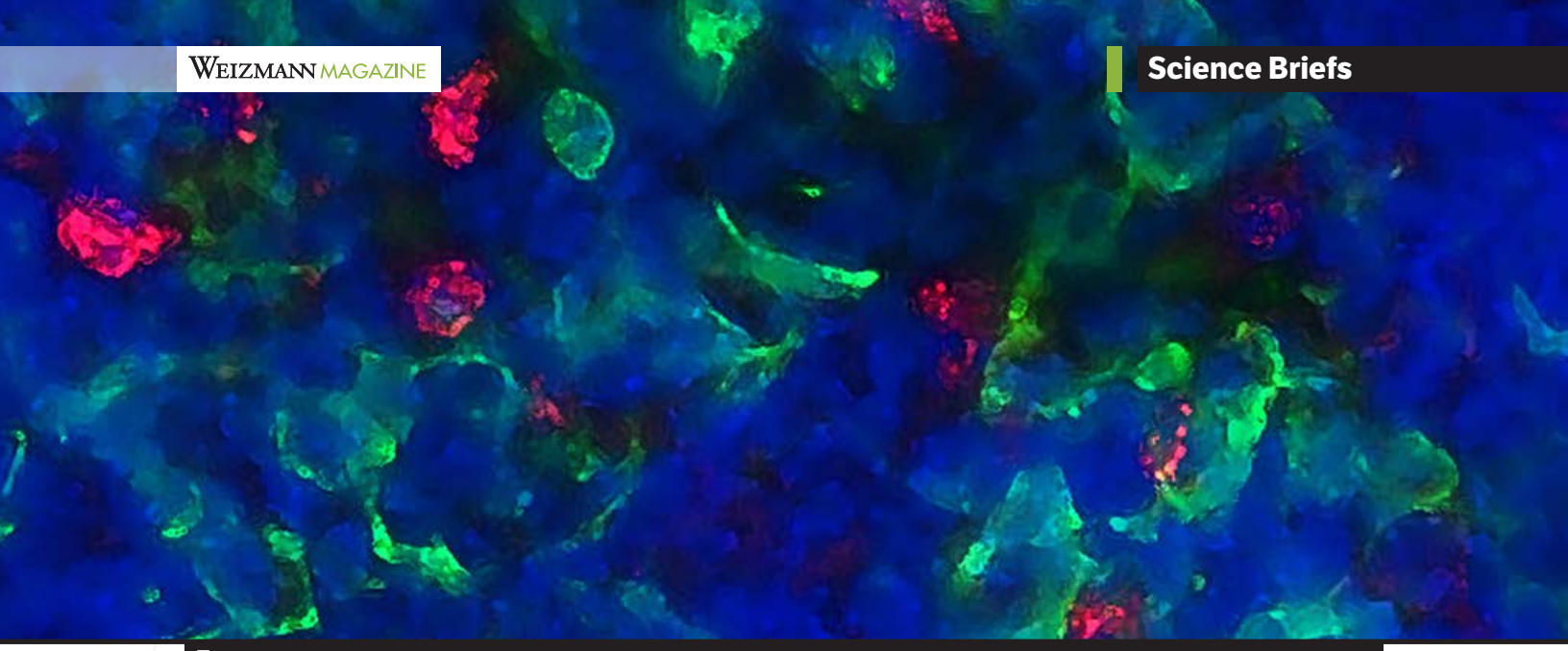

*Immunofluorescence of a mouse thymus, showing cells that line the thymus (green) and AIRE proteins (red dots).* Picture by Ayelet Avin

# When a rarity is common

A hereditary autoimmune disease that was thought to be exceedingly rare may have a less severe form that affects one in 1,000 people or even more, according to new research conducted at the Weizmann Institute and the University of Bergen in Norway. The results of this research, which appeared in *Immunity*, suggest that a number of different autoimmune diseases and syndromes may be tied to mutations in a single gene. The discovery, it is hoped, will help to provide new means of diagnosing and treating autoimmune disorders.

The finding was published by the Weizmann Institute's Dr. Kobi Abramson of the Department of Immunology and Dr. Eystein S. Husebye of the University of Bergen, an endocrinologist and researcher who first noted the discrepancy.

*Dr. Kobi Abramson*

The AIRE protein is produced in the thymus and controls the mechanism that prevents the immune system from attacking the body itself. When AIRE is defective, it results in a disease that causes a devastating constellation of medical problems ranging from an attack on and destruction of multiple tissues and organs in the body, to chronic infections. Like all autoimmune diseases, it arises when the body's immune cells mistake "self" for "foreign," and thus assault the body's own tissue.

People carrying mutations in both copies of the AIRE gene (which codes for the AIRE protein) suffer from the severe form of the autoimmune syndrome. But what about those who carry a mutation in only one copy of the AIRE gene? The common medical wisdom says that the disease is recessive: that is, symptoms will only arise if both copies of the AIRE gene are mutated. The two labs challenged this widely accepted notion, and demonstrated that even a mutation in a single copy of the AIRE gene may be enough to disrupt its function and cause devastating autoimmunity. This is because AIRE proteins bind to one another, forming an active complex and, as in other, similar cases, a specific mutation in one copy is enough to disrupt the function of the entire complex in a so-called dominant manner.

The AIRE gene is almost exclusively expressed in the thymus. This small organ is where T cells—the "special forces" of the immune system—undergo a sort of "basic training" before being released into the bloodstream for their defense mission.

# Science Briefs

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Prof. Nir Gov

Dr. Ofer Feinerman

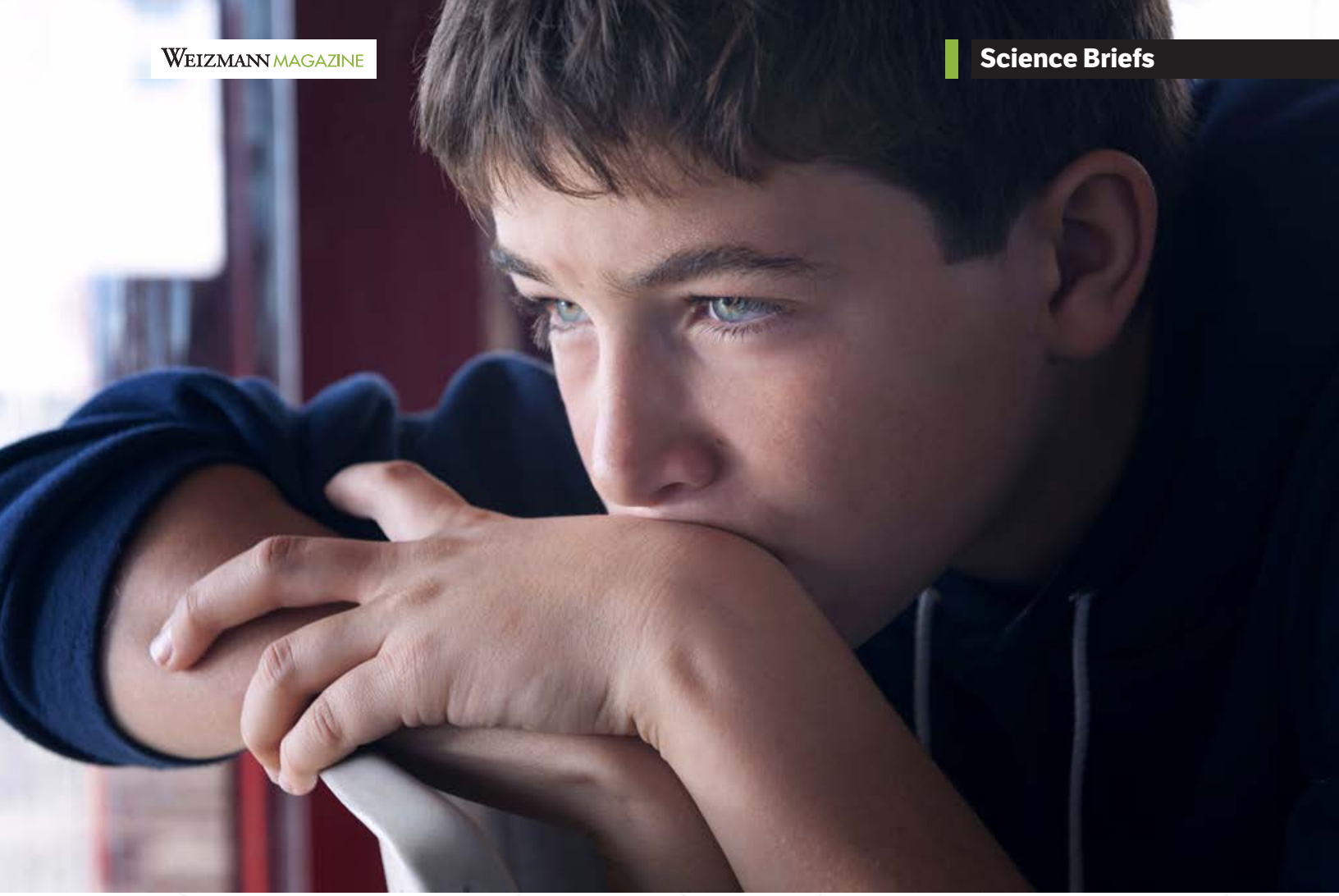
# What ants teach us about conformism and individuality

Anyone who has ever watched an army of ants scurrying to carry a large crumb back to its nest has probably wondered how these tiny creatures manage the task. New research at the Weizmann Institute of Science, which appeared in *Nature Communications* in July, explains how a mix of individual direction and conformist behavior enables ants to work together to move their food in the desired direction.

To lug a large object, a number of ants surround it: Those in the back lift, while the ones in the lead pull. How do they stay on track, instead of the whole task turning into a tug-of-war? Dr. Ofer Feinerman and his group in the Institute's Department of Physics of Complex Systems used video analysis to track the individual movements of ants in a group that were carrying a large food item toward their nest.

What they found was that the more ants that gathered around the item—for example, a breakfast cereal nugget—the faster they could move it. But while the bit of food always traveled in the general direction of the nest, its path was one of a multitude of wrong turns and corrections. Together with the group of Prof. Nir Gov of the Department of Chemical Physics, the scientists found that the ants that join the group latest steer the object while the others conform to the general motion.

What can this study teach us about the role of individuality within a group of social animals? Says Dr. Feinerman: "In this system, the wisdom does not come from crowds. Rather, some individuals supply the 'brains' and the role of the group is to amplify the 'muscle' power of savvy individuals so that they can actually move the load."



# Simple smell test might detect autism

Weizmann Institute scientists have revealed an intriguing connection between the sense of smell and autism spectrum disorder—findings that may contribute to early diagnosis of the disorder.

Prof. Noam Sobel, Head of the Department of Neurobiology, and research student Liron Rozenkrantz measured reactions in children to odors by gauging the sniffing response. "We inhale more deeply when we encounter a pleasant odor; less deeply for a bad one," says Rozenkrantz. "This activity is controlled, in part, by the cerebellum, which also plays a role in autism."

A total of 36 children were enrolled in the study: 18 with autism spectrum disorder and 18 typically developing. It was conducted with Prof. Ditza Zachor (who is an M.D.), Head of the Autism Center at Assaf Harofeh Medical Center. During the 10-minute experiment, each child was exposed to a variety of odors—both pleasant and unpleasant. The researchers measured their breathing patterns in each instance. The measurements showed that the control group had normal sniffing responses: deeper breaths for pleasant odors and shallower breaths for unpleasant ones. The children with autism had a different response: they didn't modify their breathing.

The researchers were able to ascertain with 81 percent accuracy—based on sniffing-response data alone—whether a child was autistic. The more severe the autism, the more atypical the sniffing response, showing up as a longer inhale in response to an unpleasant odor.

Because the test does not require either the use of language or particularly high cognitive skills, the scientists hope that in the future it may be used to assist in the diagnosis of autism at an earlier age than is possible today.

*What was once thought to be the "garbage" around our genes has been found to be intricately involved in the lives of cells in health and disease.*

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# The challenge of ALS

They were once thought to be the "garbage" around our genes. But, as it turns out, they are actually treasure: microRNAs—tiny strands of RNA, which control the expression of our genes—are in fact intricately involved in nearly all aspects of regulating the lives of cells and play roles in all human diseases.

Prof. Eran Hornstein's research is bringing these short RNAs into the spotlight, showing, for example, that certain microRNAs are crucial for the survival of motor neurons. When these fail to function, the result may be amyotrophic lateral sclerosis (ALS / Lou Gehrig's Disease), a devastating motor neuron disease that gradually robs its victims of movement.

*Prof. Eran Hornstein and a colleague*

Recent research in his lab points to the malfunction and to possible treatments for the disease. Prof. Hornstein and his group have found that in ALS, an enzyme called Dicer is failing. Dicer is responsible for the processing of almost all microRNAs so they can reach their mature, active form. When Dicer gets jammed, he says, the resulting defects lead to the loss of microRNA activity in nerve cells and ultimately to the death of those nerve cells—and atrophy of the muscles they control.

In continued research, Anna Emde, MD, a PhD student in Prof. Hornstein's lab, identified an existing drug called Enoxacin—an antimicrobial medication used for treating genito-urinary tract infections—as a possible treatment for slowing the progression of ALS. Because Enoxacin has already been proven reasonably safe for use on humans, Prof. Hornstein says that once clinical trials of the drug begin, the road to approving it for broad use against ALS could be relatively brief.

Meanwhile, Prof. Hornstein and his team are also working on developing additional drugs that will be RNA-based and specifically focused on preventing or reversing the disease-causing malfunction in the Dicer-microRNA-motor neuron cycle in ALS.

# Dr. Michal Leskes

## *Energizing the future*

Batteries now power everything from tiny pacemakers wired to the human heart to the engines of zero-emission cars and light trucks. Just about everything electrical that is not plugged into the wall is run by a battery. We take them for granted, but the innards of batteries are somewhat complex. Enhancing their performance—their ability to "keep going" for longer and store energy from different sources—is a research niche that a growing number of basic scientists around the world are starting to focus on. One of them is Dr. Michal Leskes, who joined the Department of Materials and Interfaces at the Weizmann Institute in July. She focuses on rechargeable batteries such as the lithium-ion batteries that power a wide range of consumer electronics ranging from laptops and cell phones to hybrid and all-electric cars.

She did her PhD studies at the Institute, where she contributed to innovations in solid-state nuclear magnetic resonance (NMR) research while working with Prof. Shimon Vega in the Department of Chemical Physics. As a postdoctoral fellow at the University of Cambridge,

# New Scientists

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she used this powerful technology to peer into the inner workings of rechargeable lithium-ion and lithium-air batteries in action. She monitored the dynamics of the molecules, ions, and electrical charges formed at their electrodes during charging and discharging. That information is helpful in examining essential processes, such as capacity fading and inefficient recharging, which affect battery performance. It is this type of basic research that has the great potential to lead to new strategies for improving battery technology.

Dr. Leskes grew up in Rosh Pina, overlooking the Kinneret (the Sea of Galilee). She credits her high school chemistry teacher for both her interest in science and for encouraging her to date her future husband, Shai, a fellow student. "Naturally, I ignored her advice. What do teachers know about boys after all?" she jokes. But, a few years later into her army service, while sharing a long bus ride to their respective bases—hers in the Negev, his near Tel Aviv—the spark ignited. She went on to complete a BSc in chemistry at Tel Aviv University; Shai became a computer programmer.

As an undergrad, she spent one summer on the Weizmann Institute campus, as part of the Kupcinet-Getz International Science School for outstanding undergraduates, working in the lab of her future PhD advisor, Prof. Vega. Dr. Leskes was attracted to nuclear magnetic resonance (NMR) research because, she says, "It lets me look inside at the details of atoms and molecules. I love the chemistry of how different molecules interact and how small changes in the chemistry of a material can alter its properties. NMR lets me examine them even more closely. What is so intriguing to me is that the more you know about the techniques—how to manipulate the spins and control their interactions—the more information you can get on the materials and how they function." Her PhD work with Prof. Vega on the theory and techniques of solid-state NMR contributed several improvements to increase its resolution.

## The chemistry of batteries

For her postdoctoral work, Dr. Leskes was interested in studying a chemical system in action, and chose a lab at the University of Cambridge that worked with NMR as a tool to improve the performance of lithium ion batteries. "Battery research deals with a real piece of the energy situation; it is needed and highly relevant, and NMR gave me the means to look inside a working battery on the molecular level."

The Israel National Postdoctoral Award Program for Advancing Women in Science, a donor-backed program spearheaded by the Weizmann Institute, helped Dr. Leskes and her husband make her postdoc period in England doable from a financial perspective. "More importantly," she says, "it really confirmed that what I was doing was the right thing; that I can do what it takes to become a research scientist. And it gave me an extra push—just like my chemistry teacher had— to continue to grow in science."

Now back at the Weizmann Institute, establishing a lab of her own, Dr. Leskes is committed to pushing the sensitivity and reach of magnetic resonance to new levels, with potentially revolutionary ideas about how to use this new power to improve the capabilities of a variety of high-performance batteries. She appreciates being back in the dynamic "give-and-take" of Israeli science, saying: "I am constantly involved in discussions—not just chats over coffee, but where people from various labs and different fields really get involved in each other's work, and encourage each other."

Her research involves the heavy use of a powerful, highly customized magnetic resonance machine (a new 7 Tesla to be acquired by the Institute) that can handle techniques from conventional NMR to dynamic nuclear polarization, utilizing the electrons spin. She hopes the results will be the ability to see more details of even smaller numbers of atoms and molecules, and that this kind of information will help her make storage batteries even more efficient and powerful.

# Dr. Ofer Firstenberg

## *The power of (photonic) attraction*

Photons—particles of light—are not known for their social behavior. Measurements show that even within a highly focused laser beam, it is each photon for itself. But Dr. Ofer Firstenberg, who recently joined the Weizmann Institute's Department of Physics of Complex Systems, succeeded for the first time, together with his colleagues, to get photons to stick together to make "molecules of light."

Dr. Firstenberg led the experiments that achieved this feat while conducting postdoctoral research at the Harvard Quantum Optics Center in Boston, where he was also a visiting scholar at MIT. He and his colleagues there created a special atmosphere in which photons could acquire mutual attraction: in this case, a thin, ultra-cold cloud of gas and several lasers.

Now, in his Weizmann Institute lab, Dr. Firstenberg plans to build two experimental systems: One of them will be very cold; the other will work at room temperature. In both, his aim will be to not only create these special molecules of light, but to use them to explore basic properties of quantum physics—the realm in which light particles exist.

Dr. Firstenberg grew up in Rishon LeZion, not far from the Weizmann Institute. His love of physics, he says, comes from a high school teacher who received her degree from the Institute's Department of Science Teaching, as well as his uncle, Dr. Udi Shafir, who received his PhD from the Institute (and is a visiting scientist this year in the lab of Dr. Barak Dayan).

Dr. Firstenberg completed his BSc in physics at the Hebrew University of Jerusalem within the army's prestigious Talpiot program. He received his MSc and PhD in physics from the Technion-Israel Institute of Technology. Then he ventured into industry, carrying out his PhD research in the quantum

optics lab at Rafael Advanced Defense Systems Ltd., under the co-supervision of Prof. Amiram Ron of the Technion and Prof. Nir Davidson of the Weizmann Institute, before heading off to Boston.

He joined the Institute a year ago, and his wife Michal is a senior intern in the Department of Organic Chemistry. They have two daughters.

## Coupling

Today, he is building experimental systems using two lasers. The first is relatively strong. It clears out a sort of "transparency tunnel" inside the otherwise very opaque gas. Then he shines a weak laser beam into the tunnel. This is made up of photons that are extremely sluggish: They move at about a millionth of the normal speed of light. And they interact with the gas atoms in the chamber: They hit these atoms and cause the electrons in them to get excited, jumping into orbits that are much larger than normal, so the atoms become thousands of times bigger than the same atom at rest. When the electrons in a pair of atoms are kicked into high orbit, they act like antennas, creating a force between them. This force becomes the power of attraction when it is transferred to the photons, and the two individual particles become a couple.

The fact that such extraordinarily independent particles as photons can stick together has raised new questions that Dr. Firstenberg intends to explore. For example: How does the force that holds two photons together compare with the forces that exist within atoms or materials? What new physical phenomena can be observed by getting photons to interact with atoms and with one another?

If the work in his lab is all about mutual attraction—in the atomic world—he takes the theme to heart at home. He and Michal are competitive ballroom dancers, and their forte is the Argentinian tango.

*Dr. Firstenberg and his wife, Michal, with their daughters*

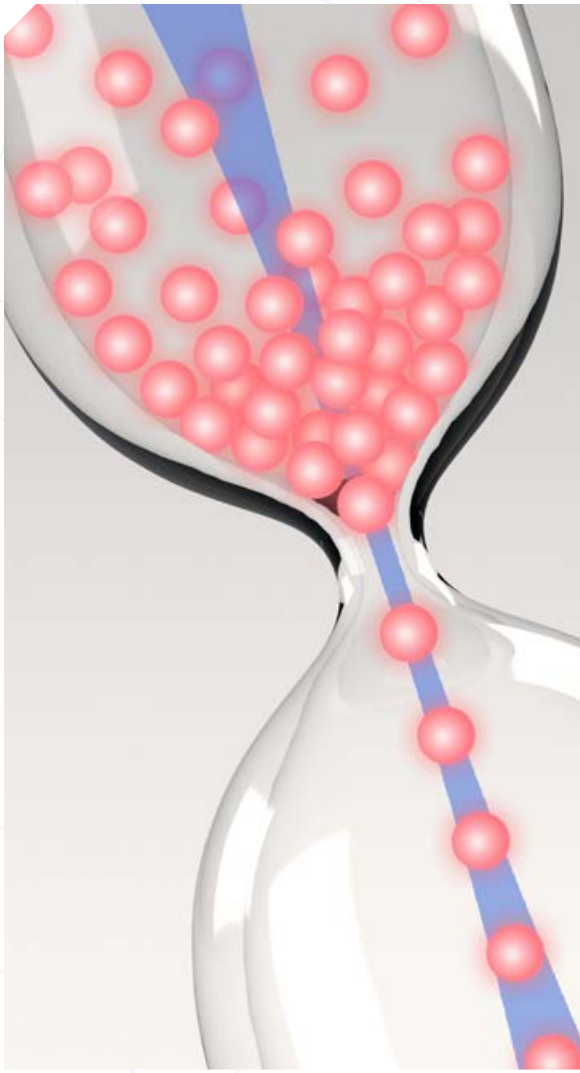
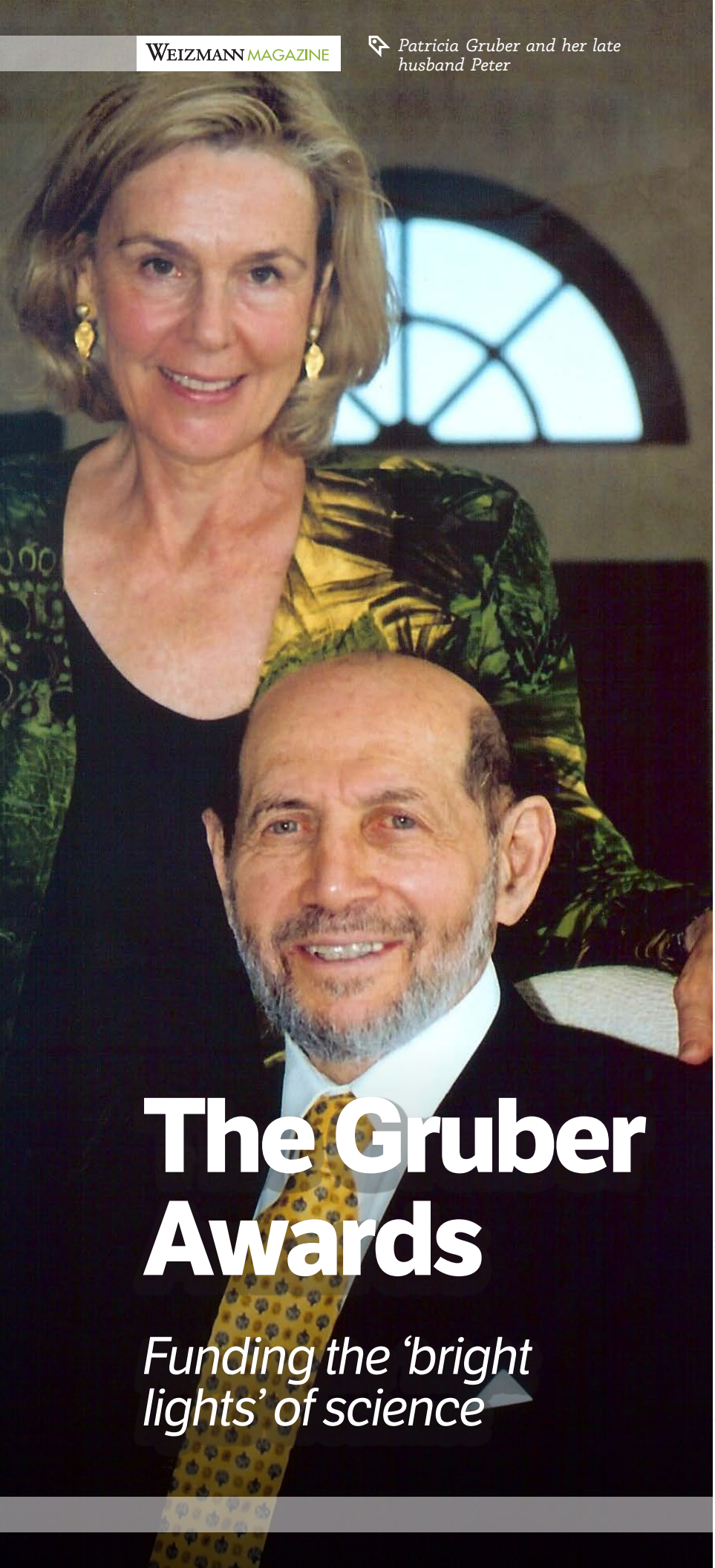


*Illustration of one of the main goals of the Firstenberg lab, to realize an ordered "train" of photons. Dr. Firstenberg starts (on the top left) with classical laser light, for which the photons arrive at random times, and sends them through a cold gas of atoms. The light that is transmitted through the medium is very non-classical; the photons there arrive one-by-one, separated by a constant time interval. The hourglass illustrates the timely manner in which the photons cross the special medium.* Credit: Dr. Firstenberg and Yoav Sterman.



Patricia Gruber and her late husband Peter



# The Gruber Awards

## *Funding the 'bright lights' of science*

Nine years after the Gruber Foundation began awarding the prestigious Peter and Patricia Gruber Award to a newly hired promising young scientist at the Weizmann Institute, Patricia Gruber says she is "proud" the award is doing what it set out to do. "This award is a vehicle for identifying young superstars in science," she says. "Through the funds offered by the prize, it helps bring their research to a new level."

The three-year award means that there are three Gruber awardees at any given time. Recipients use the funds for research and travel, as well as to support postdoctoral fellows and PhD students in their labs.

In an interview from her home in St. Thomas, U.S. Virgin Islands, Patricia Gruber reflected on the origin of the foundation and the awards.

The foundation that bears their joint names was launched by her late husband. In 2000 they began to identify prize areas that would later define their philanthropy. Peter died in 2014 after a long and productive life. While he was still alive, the program and its endowment were passed on to Yale University. The values that characterize the prizes include three areas of science—genetics, neuroscience, and cosmology; as well as rule of law and women's rights. The three international science prizes will continue to be awarded by the Gruber Foundation at Yale, and the human rights programs will be implemented at Yale Law School.

# Spotlight On



*Dr. Yifat Merbl, recipient of the 2015 Gruber Award*

Peter developed a love for science and education over his lifetime. Born in Hungary to Jewish parents in 1929, he fled the country a decade later—three months before the start of World War II—with his family for India. During the brief Japanese bombing of Calcutta, his parents sent him to a Catholic boarding school in the Himalayas. "There, immersed in the spiritual traditions of India," says Patricia, "he embarked on a lifelong quest to understand the meaning of life, and garnered enormous respect for all religions." She adds, "Peter was a global thinker, an ethically committed person who was aware of the difficult lives of people in many parts of the world." He studied Buddhism, and in his twenties founded the Oriental Studies Foundation, which sponsored the translation of Tibetan wisdom texts.

Peter and Patricia met in Berkeley, California, in the 1980s, and during their 26 years together embarked on a philanthropic journey that became rewarding for both. Peter was a successful asset manager who focused on emerging markets, and Patricia was a marriage and family counselor. The couple established the foundation in 1993, and moved from California to St. Thomas two years later.

In St. Thomas, the foundation funds local schools including the Peter Gruber International Academy, as well as local cultural and service organizations. The Grubers initiated the Weizmann Institute's Gruber Awards to encourage the outstanding scientists at the Weizmann Institute. An annual Award is given to an Institute scientist every April in a teleconference broadcast between Rehovot and St. Thomas. The ceremony takes place in the presence of an audience including students of the Peter Gruber International Academy, the Antilles School, and others. It has inspired increased interest in science among those who attend.

This year's winner, Dr. Yifat Merbl, who was a big hit with the student audience, said that she was honored to receive the award and is "grateful for the generous support of the Gruber Foundation... The award is a vote of confidence in my research at a time when I am establishing my lab—a very important moment in a scientist's career." Dr. Merbl studies the fine-tuning process of the body's proteins.

"We like to invest in individuals—a person with an excellent brain and tremendous motivation," says Patricia, adding that in recent years she and Peter wanted to bring focus to women scientists in particular. In establishing the Gruber Young Scientist Awards, she says, "We thought: 'Let's empower all those bright lights, including women,' and in that way we are investing in the future of science. With the funds being so well-managed by the Institute, we hope the award will go on for a long time."

## Peter and Patricia Gruber Award recipients

- Dr. Yifat Merbl, Department of Immunology, 2015
- Dr. Michal Rivlin, Department of Neurobiology, 2014
- Prof. Yardena Samuels, Department of Molecular Cell Biology, 2013
- Dr. Tali Kimchi, Department of Neurobiology, 2012
- Prof. Zohar Komargodski, Department of Particle Physics and Astrophysics, 2011
- Dr. David Margulies, Department of Organic Chemistry, 2010
- Prof. Gilad Perez, Department of Particle Physics and Astrophysics, 2009
- Prof. Avishay Gal-Yam, Department of Particle Physics and Astrophysics, 2008
- Prof. Elad Schneidman, Department of Neurobiology, 2007

# Sculpting science

*How René and Susanne Braginsky are facilitating the fusion of science and the humanities at the Weizmann Institute*

If there is a signature motif of the Braginsky family philanthropy, it is an effort to preserve the narrative thread of Jewish and Israeli heritage. So how does the Weizmann Institute fit into that "story"?

"The Weizmann Institute is a continuation of that thread which must be preserved and strengthened, because Israeli science and technology, education, and the Jewish commitment to education are all part of the story of Israel's future," says René Braginsky, who with his wife Susanne established the Braginsky Center for the Interface between Science and the Humanities at the Weizmann Institute in 2010. Five years later, the Center is a thriving hub of research with an unusual twist for the Weizmann Institute: the integration of the humanities and the arts into science.

Its director, Prof. Itamar Procaccia, a member of the Department of Chemical Physics, is an art collector himself. To date, the Center has funded nearly 30 projects. Among its first projects was the Theatre Lab intiated by Prof. Uri Alon of the Department of Molecular Cell Biology, which brings together scientists and performing artists to explore themes in human interaction; one project, on coordinated motion, may lead to an intervention tool for adults with autism spectrum disorders.

"The Center is a unique vehicle that enables the support of highly innovative projects

René Braginsky

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*"Israeli science and technology, education, and the Jewish commitment to education are all part of the story of Israel's future."*
*—René Braginsky*

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which would otherwise not be funded by standard granting agencies," says Prof. Procaccia. "This may promise unprecedented insights and shed light on often overlooked areas in research that involve the nexus of humanities and science."

*René and Susanne Braginsky*

René and Susanne Braginksy live in Zurich and split their time between Switzerland and Israel. Their son David and his family live in Tel Aviv. René, a banker who runs his own boutique office in Zurich, is a past president of Keren Hayesod, and he and Susanne are major supporters of the Israel Museum and other institutions in Israel and Switzerland, including ETH Zurich.

The Braginskys' relationship with the Weizmann Institute originated in his friendship with Maurice Dwek, former chairman of the European Committee of the Weizmann Institute of Science and an International and Executive Board member who passed away in 2013. René was president of the Society of Swiss Friends of the Weizmann Institute of Science from 1999 to 2009, and received an honorary doctorate from the Institute in 2012. As president of the Society of Swiss Friends, he says he "witnessed the passion... with which students and researchers from all over the world approached scientific challenges. It is this belief in the future and this great drive which characterize the Weizmann Institute of Science."

As president, he started an annual lecture series that continues to bring Weizmann Institute scientists to Switzerland in a forum that typically involved a Swiss scientist and one from the Weizmann Institute. During that period, he substantially expanded the Institute's network of friends and supporters in Switzerland.

After stepping down from the role, the Braginskys made a gift to establish the Braginsky Center for the Interface between Science and the Humanities. Its agenda "fits perfectly with our commitment to the arts, humanities, and history and at the same time serves to advance science at the Weizmann Institute in a creative, inspiring direction," says René.

The couple's commitment to preserving the Jewish narrative is rooted in their family history. René's father was orphaned at age 16 and survived World War II in Switzerland. "It is only today that my brother and I have the privilege of leading peaceful and secure lives," he says. "We are profoundly grateful for this." The family's geographical trajectory over time—moving from Eastern Europe to Western Europe, and children moving to Israel in the last decades—"explains our cultural and charitable activities in Israel," he adds.


*Decorated Esther scroll from Venice, copied by Estellina bat Menahem, 1564. Braginsky Collection, Zurich.* Photography: Ardon Bar-Hama, Ra'anana

***"The manuscripts provide me with a direct connection to my Jewish past."***
*—René Braginsky*

*René Braginsky receiving his honorary PhD from the Weizmann Institute in 2012*

Susanne is the former publisher of *Aufbau*, a German-Jewish magazine published in New York, a role she took on, she says, to preserve this special piece of Jewish history. She is independently involved in many philanthropic activities that also align with the themes her husband holds dear.

In line with their belief that Jewish communities worldwide should promote Jewish history and heritage, the couple established the Braginsky Foundation 30 years ago, which supports numerous projects that do just that, including exhibitions and museum.

One of René's biggest passions is his collection of Jewish manuscripts, known as the Braginsky Collection. It includes more than 80 medieval Hebrew manuscripts, the largest compilation of 18th Century *haggadot* [Passover Seder books] and prayer books, and a unique private collection of *megillot* [scrolls] and *ketubot* [marriage certificates]. The collection, which is kept in Zurich, has been exhibited in Amsterdam, New York, Jerusalem, Zurich, and Berlin.

One of the Braginskys' favorite pieces in their collection is the famous Charlotte von Rothschild Passover Haggadah, with German translation. It was copied by Eliezer Sussman Mezeritsch and decorated by Charlotte von Rothschild, the niece of the renowned German banker Amschel Mayer von Rothschild, on the occasion of his 70th birthday in 1842. It is the only manuscript known to have been illuminated by a woman. Photography: Ardon Bar-Hama, Ra'anana.

In 2009, on the occasion of his 60th birthday, he published *A Journey through Jewish Worlds: Highlights from the Braginsky Collection of Hebrew Manuscripts and Printed Books*, which describes his love for this art form and its role in preserving the historical narrative of the Jewish people. The collection has been digitized and a sampling is viewable on his website (www.braginskycollection.ch) and on iPad apps. A new English website is currently under construction.

René has always been a collector: Before Jewish manuscripts, it was stamps and coins, paintings, and books. As an entrepreneur and investor, he says, "I find that many people seem to believe that financial and economic crises are unique phenomena. We tend to overestimate current problems and often find it difficult to put them into their proper historical perspective. This realization leads to the key notion of my activities as a collector, that without knowing the past, we can hardly come to terms with the present and much less prepare for the future."

His manuscript collection started when their son, David, who is 36, had his bar mitzvah. "I started to look for a *bentsher* [prayer booklet of blessings after meals] for that occasion, but I couldn't find a really beautiful one in time and had to make do with a copy." He talked to a good friend, an expert in Jewish manuscripts, and he began collecting; 25 years later this private hobby came to be known as the Braginsky Collection.

"The manuscripts provide me with a direct connection to my Jewish past," says René. "It is comforting that in today's hectic world, one can return to these century-old objects and realize that what is really important will stay."

# Perfect fusion:
# A sampling of programs funded by the Braginsky Center

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## Does art therapy really work?

Individuals suffering from stress, anxiety, depression, and other symptoms of serious and chronic diseases such as cancer, Alzheimer's, and schizophrenia often turn to art therapy for relief. But art and other expressive arts-based therapeutic interventions are not founded on clinical experiments and physiological reasoning as drug therapies are. Prof. David Harel and Dr. Bilha Sandak of the Department of Computer Science and Applied Mathematics are developing a computational paradigm for showing, with empirical precision, if and how complex dynamic behavioral processes work in the expressive arts—visual, music, and dance—with the goal of applying it to patients, and in other real-world settings.

## Do genes and language share evolutionary patterns?

Both genes and languages evolve. What can we learn about the evolution process of each to apply to the other? In this project, spearheaded by Prof. Yitzhak Pilpel of the Department of Molecular Genetics and Prof. Ghil'ad Zuckermann of the University of Adelaide, a linguistics expert, principles in computational genomics are being applied to the evolution of the Hebrew language; and vice versa.

The duo has been able to quantify major dynamic trends of language change, such as the takeover of Biblical and Talmudic terms by neologisms, the transfer and acclimation into the language of foreign words, and grammatical and stylistic changes—for example, the four-fold shortening of sentences over the last century. And just as written neologism of today become tomorrow's lexicon—like "drive through" becoming "drive thru"—they have been able to show that RNA and DNA "mimicking" changes occur, generating new breeds of genes created under certain conditions.

## How does coordinated behavior emerge?

Think regatta racers: How do the athletes attain near-perfect unison in their rowing movements? Dr. Itai Cohen of Cornell University is exploring how collective behavior arises in animals that form flocks, herds, and swarms; and how humans can coordinate in similar ways—like when a regatta team races for the finish line or a couple dances the tango. The study of movement in animals and humans—called biolocomotion—offers rich data sets for study. Dr. Cohen and his colleagues are now trying to discern what cues affect the ability to achieve and maintain synchronous movement.

# Reaping the benefits of plant research

*How Weizmann Institute scientists are advancing food security in an insecure era*

# Cover Story

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In Israel's earliest days, Weizmann Institute scientists invented a method for waxing oranges so they could be shipped, which was a major boon for the country's then-fledgling, agriculture-based economy. Since those days, the Weizmann Institute of Science hasn't stopped working toward improving food security—not just for Israel, but for the world. But today the task is more daunting than ever: By the mid-21st century there will be nine billion mouths to feed; and climate change is expected to have an impact on agriculture, possibly a considerably negative impact.

Institute scientists are addressing the challenges from a variety of approaches. They are figuring out how plants can better resist drought, be grown more efficiently, provide more nutrition, and take up carbon and convert it to edible proteins and sugars in better ways—and all this without further destroying the planet's remaining biodiversity or polluting our soils and waterways.

Weizmann Institute success stories in engineering better crops range from wheat to tomatoes to maize and melons, with work carried out by scientists mainly in the Department of Plant and Environmental Sciences. Prof. Avraham Levy, for example, developed the Micro-Tom tomato, which can be grown at a density of up to 1,000 plants per square meter and has a life cycle of less than three months, making it ideal for researching plant genes. Micro-Toms helped reveal many genes for plant fertility, metabolism, and uptake of nutrients. They also helped Israel's biotech industry: They were licensed to Evogene Ltd., when it was founded in 2002 with Prof. Levy's help.

Before that, Prof. Jonathan Gressel took on a problem that was exasperating farmers in sub-Saharan Africa, where a parasitic weed called witchweed had historically destroyed up to half of the crops for many years. Prof. Gressel created maize seeds that were resistant to a particular herbicide; coating the seeds in the herbicide then kills the parasitic weeds in the soil before they can attach themselves to the sprouting maize. Yields tripled in experiments he conducted in Kenya, and the seeds have been commercialized in western Kenya and Uganda.

# Preventing crop loss

Today, work in this field at the Weizmann Institute is more diverse than ever. One of the biggest challenges is preventing the destruction of crops from pests, weather, disease and other factors. Indeed, around 30 percent of crops worldwide are lost to such elements before they are even picked.

Plants have highly complex defense systems—scientists are still realizing just how complex these are—but they need help adjusting to the demands of agriculture and changing environmental conditions. Prof. Robert Fluhr investigates these natural defense systems. For example, he has identified a "pace setter" within the plant: a molecular switch that regulates the cells' protein degradation machinery when the cell is under attack. By controlling the rate at which the contents of cells get destroyed, pace setters appear to limit the damage, getting rid of injured or infected cells while refraining from suicide. This finding has opened up a new avenue of research, namely identifying additional pace setters that may regulate other aspects of plant growth and development.

Another 25 to 40 percent of a crop is lost after it is picked, due to spoilage and consumer waste. Other research in Prof. Fluhr's lab may address the problem of fruit that looks perfect in the produce aisle, but goes bad the minute it begins to ripen at home. He and his group found one reason for that phenomenon: a fungus that hitches a ride home on the fruit, which has mechanisms for remaining quiescent until the time is ripe (no pun intended) to hijack the host's self-defense mechanisms and promote its own growth. This research, it is hoped, will pave the way toward stopping this sort of waste.

## Growing vs. blooming

Before they produce seeds, grain, or fruit, plants must undergo flowering and pollination. Just like an expectant mother's pregnancy, this early stage is particularly sensitive to environmental conditions. Plant growth slows or stops as resources are diverted to blooming, and if temperatures and pollinators are not coordinated, this can spell disaster for a crop. Prof. Yuval Eshed of the Weizmann Institute, in collaboration with Prof. Eliezer Lifschitz from the Technion – Israel Institute of Technology, identified a substance that had been predicted to exist for decades, called florigen, which halts growth and induces blooming; blooming is a life-cycle stage in which the plant ceases to grow. They further discovered that florigen comes with inhibitors that are structurally similar to the florigen itself. It is the balance between florigen and its inhibitors that determines the plant's vital "decisions" to grow today and blossom tomorrow.

Other research in Prof. Eshed's lab has revealed a balance between the signals inherent in plants that determine leaf size. An in-depth understanding of these mechanisms could help enhance plant growth or adapt crops to changing climate conditions.

*Prof. Yuval Eshed*

*Prof. Jonathan Gressel*

## Taking the guesswork out of plant breeding

Breeding new plants for better and different tastes, faster growth, resistance to insects, and extending their seasonal availability once involved a great deal of trial and error—and a huge dose of patience. Weizmann Institute researchers are trying to take that guesswork out of plant breeding. Understanding exactly how plants respond to stress or growth conditions can help breeders tailor varieties to specific

environments or needs. Prof. Asaph Aharoni studies the mechanisms that govern the production of the thousands of chemicals that plants produce. In his lab, which is unique in Israel and one of only a few in the world, he has created the infrastructure for conducting a comprehensive analysis of the metabolome, the detailed metabolic profile of a plant. A metabolome of the model plant *Arabidopsis,* completed in his lab, looked something like a map of the London Underground. The "lines" in this metabolome are unique biochemical pathways that may, for example, be boosted or blocked to produce hardier, more nutritious or tastier crops.

Among the substances he and his team have investigated is Solanine, a toxic chemical produced by green potatoes to ward off insects. Further research in his lab concerns vitamins and various flavonoids, betalains and carotenoids—antioxidants that give color to our fruit and benefit our health.

## Making better wheat

The wheat that provides bread and pasta for most of Western civilization is a challenge for researchers. Each grain carries three separate genomes; altogether they are about six times more complex than the human genome. In the past, the Institute's Prof. Moshe Feldman developed innovative chromosomal engineering techniques and used them to incorporate desired genes from wild emmer wheat, the progenitor of cultivated wheat, into cultivated wheat varieties. The resultant varieties are more disease-resistant and provide higher grain and protein yields, enabling the production of more food on the same amount of land.

The three genomes are the result of the hybridization of three different wild wheat species, and cultivated wheat has spread throughout the world thanks largely to what's known as "hybrid vigor"—the puzzling fact that hybrids tend to be superior to their

*Prof. Avi Levy*

*The wheat that provides bread and pasta for most of Western civilization is a challenge for researchers. Each grain carries three separate genomes; altogether they are about six times more complex than the human genome.*



parents, a phenomenon that is widely used in agriculture to enhance crop productivity. Prof. Levy is working with Prof. Naama Barkai of the Department of Molecular Genetics to uncover the secret of hybrid vigor, finding evidence for the mechanisms that enable the hybrid to outperform its parents. Their work explains how gene expression is reprogrammed in the offspring, and provides new insight into the genetic control of hybrid vigor.

Prof. Levy's lab group investigates the gene-based mechanisms of biodiversity in the plant kingdom. For example, one such mechanism—a tool devised by evolution and which is the basis for plant breeding—is the exchange of segments between the chromosomes inherited from each parent to create the pollen and eggs for the next generation. This process is called "homologous recombination"; Prof. Levy's work shows how the sites of these events are determined. In addition, he is building a new generation of vectors for precise genetic engineering in plants. These technologies are expected to have a profound effect on scientific research in plant genetics and breeding.


# Chaim Weizmann's acetone patent turns 100

## A centennial of entrepreneurship

Exactly one century ago, in 1915, a senior lecturer in biochemistry at the University of Manchester named Dr. Chaim Weizmann invented a fermentation process that converted starch—a poly-sugar readily available from corn and potatoes—into acetone and butyl alcohol, facilitated by a bacteria, *Clostridium acetobutylicum,* that Dr. Weizmann had previously isolated. This novel method of acetone production became known as "the Weizmann process".

As serendipity would have it, acetone was a key component in the production of the smokeless gunpowder (cordite) used by the Allies in World War I. Acetone had previously been made from calcium acetate imported from Germany, but since the Allies were at war with Germany, this was no longer possible, and the U.S. had a sparse supply. So Winston Churchill, then First Lord of the Admiralty, requested that the "Weizmann process" be used to mass produce acetone in England, Canada, and the U.S.

The rapid wartime expansion of this process, from laboratory to industrial scale, was not only unusual among microbiological processes used in industry, it also set a precedent for the rapid expansion of penicillin production during World War II and for the wide scope of applied biotechnological processes that came afterward.

***"The story of my life shows how, in the end, my scientific labours and my Zionist interests ultimately coalesced, and became supplementary aspects of a single purpose."***
*—Dr. Chaim Weizmann, "Trial and Error"*

## Remarkable implications

Dr. Weizmann knew that his fermentation process yielded chemical compounds containing three and four carbon atoms and predicted that the same process could produce the substances that are the basis for modern petrochemical industries. He often articulated the need for countries—especially those with scarce natural oil—to replace a petroleum-based chemical industry with one based on fermentation. In fact, the acetone-butanol-ethanol (ABE) fermentation process currently enjoying an industrial renaissance is based on Weizmann's process.




As history has shown, the discovery had implications beyond science. When asked by UK Foreign Secretary Arthur Balfour what he wished to receive in return for his contribution to the war effort, Dr. Weizmann boldly replied, "There is only one thing I want: a national home for my people." Duly impressed, Lord Balfour issued the famous Balfour Declaration of 1917 committing the British government to the establishment of a national home for the Jewish people in what was then Ottoman-ruled Palestine.

Ultimately, the British Mandate gave way to the modern State of Israel, and Dr. Chaim Weizmann became Israel's first president. Leveraging his political influence, the

# Special Section



Dr. Chaim Weizmann at the University of Manchester

scientist-statesman laid the groundwork for world-class science in Israel, working with Albert Einstein to raise funds for the Hebrew University Jerusalem and founding the Weizmann Institute, where cutting-edge innovation continues, propelled by the creative spirit epitomized by Dr. Weizmann's pivotal acetone patent.

Dr. Weizmann held a total of 110 patents and was a perennial inventor and entrepreneur, a basic scientist with an eye toward the benefits to society. Prior to the acetone discovery, he had conducted extensive research on naphthacene quinones, which led to patents that he sold to French and German dye companies. This research enabled the growth of the chemical companies that would form the core of German industry and spurred his belief that such research could be undertaken for both profit and the national good. While a researcher and lecturer at the University of Manchester, he simultaneously served as a consultant for local industry and began to generate a slew of patents.

GEORGE V.

BY THE GRACE OF GOD,

Herein lay the genesis of Dr. Weizmann's penchant for technology transfer—establishing a process of making scientific and technological developments accessible to industry, where such developments can be applied and integrated into new products, applications, materials, or services. This special brand of pragmatism was the basis for the establishment of YEDA, the Institute's technology transfer arm, in 1959. It was the first academic tech transfer arm in Israel, and one of the first in the world.

After his establishment of the Daniel Sieff Institute in 1934 (which was renamed the Weizmann Institute in 1949), Dr. Weizmann focused on lines of investigation of particular relevance to the then-fledgling economy of the future Jewish state, namely the commercial synthesis of organic compounds from agricultural products or petroleum. Of particular technical significance was the discovery of a process that converts petroleum or petroleum fractions into a range of aromatic hydrocarbons. That enabled industries, like pharmaceuticals, that had previously been reliant on coal tar—a resource virtually non-existent in Israel—to be independent of coal as a raw material. Moreover, this process provided the whole series of hydrocarbons that paved the way for the modern organic chemistry industry.

Heather Reisman and Gerry Schwartz

# Science central

*The new Schwartz-Reisman Science Education Centers are poised to change the future of high school science education in Israel*

# Education



Earlier this year, Gerry Schwartz and Heather Reisman of Toronto made a magnanimous gift—the single largest in Weizmann Canada's 50-year history—that establishes a series of science education centers in Israel for outstanding high school youth. In doing so, Mr. Schwartz and Ms. Reisman hope to transform the way students learn science, and, it is hoped, offer a template for science education centers worldwide.

The gift establishes the new Schwartz-Reisman Science Education Center in Rehovot, adjacent to the Weizmann Institute; an additional center to be built in Rishon LeZion; and most likely another one at a different location in Israel. The centers are based on the model of a successful, longstanding science education center in Tel Aviv that the couple has generously funded as well, at which top-notch science-oriented students from Tel Aviv high schools do advanced coursework in chemistry and physics to prepare for their matriculation exams in those subjects.

The establishment of the centers comes as a direct response to the couple's interest in nourishing high school science education in Israel. "We hope that the new centers will enrich high school science and technology learning and ultimately propel forward the future of Israel," says Mr. Schwartz.

The concept, he says, is similar to that of the HESEG Foundation, which he and his wife established in 2005, because both ultimately help ensure the future of Israel. HESEG, which is based in Tel Aviv, offers tuition and living expenses for former lone soldiers who wish to stay in Israel after their service in the Israel Defense Forces. "We feel that these young people have not only volunteered to defend the State of Israel, which is humbling in and of itself—leaving their homes and their families and everything they know and love to serve in the Israeli army—but that they are defending the Jewish people all over the world. We want these individuals to advance academically and thereby ensure their own futures in Israel," he says.

The impetus to nourish science education, meanwhile, originates from the same sentiment. "Science education is critical because strong science and industry will create a stronger Israel," he says.

"We are incredibly inspired by Daniel's vision and believe that the high school years are a very formative period during which young people develop their brain power, their curiosity, and their passion for future endeavors," says Heather Reisman. "Any small role we can play in contributing to the development of human potential for future success in Israel is compelling to us, and we are grateful for the opportunity to be involved."

Gerry Schwartz, a native of Winnipeg, is founder, Chairman, and CEO of Onex Corporation, one of Canada's 10 largest companies. Heather Reisman is founder and CEO of Indigo Books & Music Inc. They are major supporters of a number of Canadian Jewish organizations. "Both Heather's family and mine have cared about Israel enormously throughout the decades, so devoting our philanthropy to Israel is natural and obvious," he says.

Mr. Schwartz made his first visit to the Weizmann Institute campus in June. "It knocked me out," he says. "The campus is more beautiful and its buildings and labs more sophisticated than I expected—and I expected a lot," he admits.

## A model worth replicating

Planning for the Schwartz-Reisman Center in Rehovot is well underway; groundbreaking on the new facility, the Ruth and Uriel Arnon Science Education Campus, will take place later this year at a location next to the Davidson Institute for Science Education, on land provided by the Rehovot municipality. Programming has been operating since 2013 at the Davidson Institute. Already, the Center caters to over 600 high-school students in 23 classes from seven feeder schools in Rehovot and Ness Ziona.

These students benefit from highly trained teachers with advanced science degrees who form a vibrant intellectual community;

*Architectural rendering of the new Schwartz-Reisman Center in Rehovot*

## The fabulous Fab Lab

Science has become sophisticated—which means that learning science must take a parallel leap. The planned Fab Lab of the new Schwartz-Reisman Center is considered its crown jewel. Located on the first floor across from the main entrance, this unique space will house state-of-the-art machinery and equipment. Based on an existing model at the Massachusetts Institute of Technology—which was the first in a series of what has now gone global—it is expected to revolutionize experiments and activities.

The Fab Lab is a modern production room in which teachers and students are able to design tools for experiments and competitions utilizing computers. MIT's Fab Lab was created to support innovation and entrepreneurship in technology and device creation; some 300 Fab Labs now exist in 30 countries. They are comprised of industrial-grade fabrication and electronics tools (3D printers, laser cutters, circuit boards printers, etc.), with software and programs written by MIT researchers.

Fab Labs are beginning to be adopted by schools as platforms for project-based, hands-on science, technology and engineering education (STEM), with students learning through creating, and thus gaining deep knowledge about the machines, materials, design processes, and engineering that goes into invention and innovation.

state-of-the-art lab equipment that any single school cannot offer; and courses at the highest levels of sophistication. The Rehovot facility will include 18 designed "class-labs" equipped with the most advanced materials and equipment, preparation rooms for teachers and lab assistants, and a Fabrication Laboratory (a so-called "Fab Lab") where students can create tools and parts for experiments from scratch using 3D printers, laser cutters, circuit board printers, and more.

The goal of the Schwartz-Reisman Science Education Centers, says President Prof. Daniel Zajfman, is both to increase the interest of the high school kids in science and to provide them a place where they can study physics and chemistry at the highest level, under the best possible conditions. Thus, when they finish high school, "they will know that scientific knowledge is not only critical and valuable, but that the world is full of scientific wonders."

He continues, "Both Gerry and Heather understand the value of science education in general,

*"We hope that the new centers will enrich high school science and technology learning and ultimately propel forward the future of Israel," says Mr. Schwartz.*

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and how critical it is for the state of Israel. By providing this major support to the establishment of the Schwartz-Reisman Science Education Centers, they are leveraging considerably our ability to improve the quality of science education and provide a better future for the children, since it is well known that a high level of scientific literacy is one of the best predictors of their future success."

At the Center in Rehovot, says a tenth grade student at Ben-Gurion High School in Ness Ziona, "Scientific methods are learned through experiments. Because we use this active learning method, we learn more effectively and we connect to the material and understand it better than in the typical school setting where we usually learn from a book."

*Gerry Schwartz with Weizmann Institute President Prof. Daniel Zajfman on campus in June*

## The HESEG Foundation

At any given time, some 6,000 lone soldiers are serving in the Israel Defense Forces. These young men and women are living in Israel without their immediate family and therefore have little or no support system at a critical moment: after making aliya and during the challenging period of army service. The HESEG Foundation, established by Gerry Schwartz and Heather Reisman in 2005, provides tuition scholarships for former lone soldiers—individuals who completed their army service and wish to enroll in higher education studies in Israel. "Heseg" is the Hebrew word for achievement.

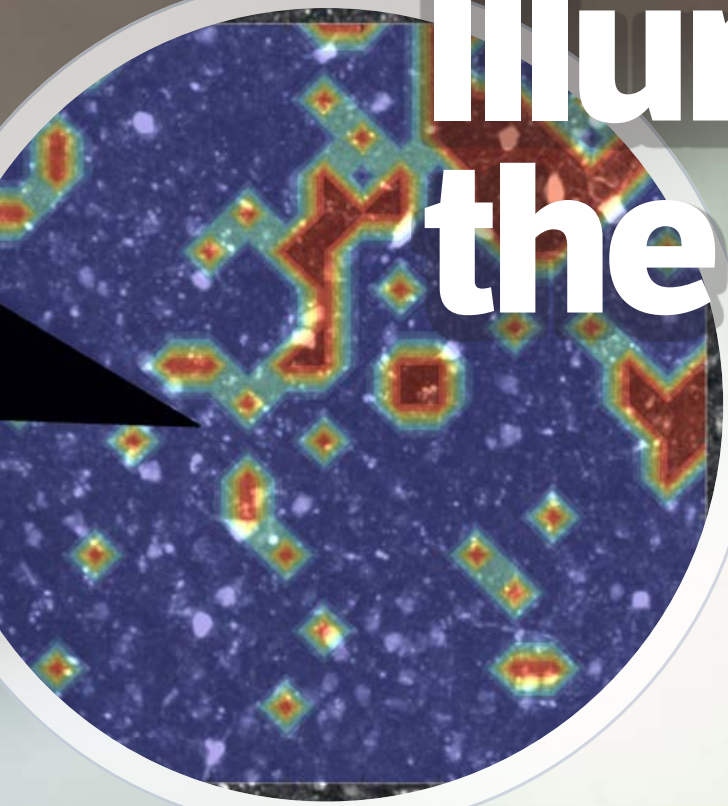
HESEG also offers a mentoring program to assist scholarship recipients and alumni in charting their career paths. It hosts holiday events for the recipients and other social and professional networking opportunities and serves the community of HESEG alumni in a myriad of ways.

In 2006, during Israel's second war in Lebanon, Mr. Schwartz and Ms. Reisman donated 100 mobile air conditioning units to provide relief for residents of northern Israel forced to live in bomb shelters.

In establishing and funding HESEG, says Ms. Reisman, "we are supporting the commitment of truly outstanding individuals who have taken a great responsibility upon themselves and give of themselves for the future of Israel."

*Dr. Ofer Yizhar and how optogenetics is literally shedding light on the brain*

# Illuminating the mind



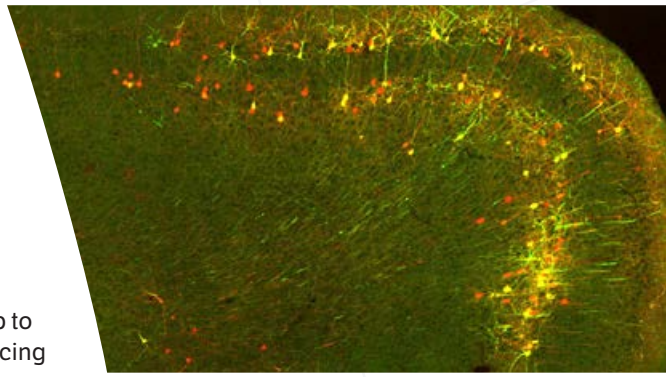
# Science Feature



Schizophrenia, autism, major depression, personality disorders: Scientists are aware today that neurological and psychiatric diseases like these are not a result of dysfunction in a single part of the brain; rather, they arise from faulty connections in different regions of it. That knowledge has led to physicians' ability to apply deep brain stimulation through the use of micro-electrodes to Parkinson's patients, and to people suffering from obsessive-compulsive disorder, epilepsy, Tourette syndrome, and depression.

But science is taking one major leap further, with the advancement of a new field called optogenetics.

First developed at Stanford University about a decade ago, the technique uses tiny, implantable optic fibers to illuminate, with incredible specificity, the neural networks involved in brain diseases and disorders, which, it is hoped, will eventually help to treat or cure them. A few scientists worldwide are now advancing the field of optogenetics; one of the young leaders is Dr. Ofer Yizhar, who joined the Department of Neurobiology at the Weizmann Institute in 2011 after a postdoctoral fellowship in the Stanford lab where he helped develop the method.



*Neurons in the mouse prefrontal cortex communicating directly with the amygdala*

*Dr. Ofer Yizhar*

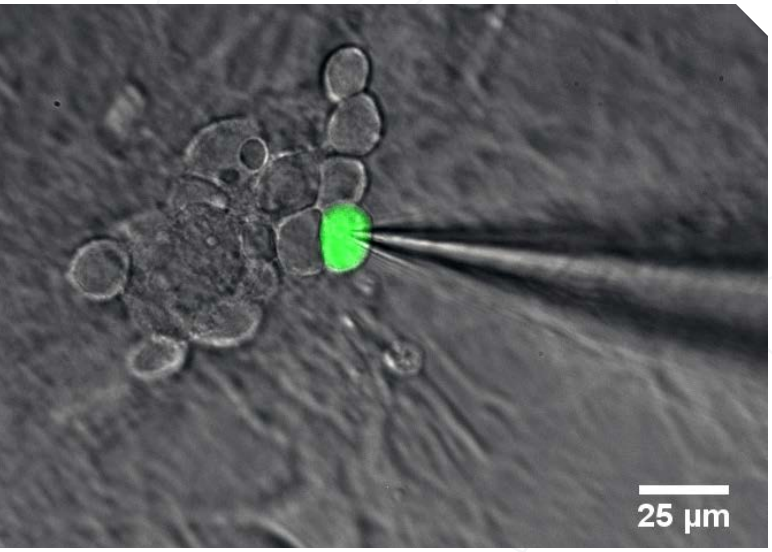
## Emotions and intelligence—an intricate dance

At this point, optogenetics is for lab animals only. Scientists like Dr. Yizhar genetically engineer mice so that their neurons produce a protein that reacts to light. Naturally found in photosynthetic algae, this protein enables the algae to move toward the light by opening channels in the cell membrane. It performs a similar task in the engineered mouse neurons when they are exposed to light from the fibers, opening channels for nerve cell signals to fire. Thus the technique provides both a switch and a signal, giving researchers a precise tool for controlling, in real time, the messaging activity between multiple neurons.

Dr. Yizhar's research group focuses on the ways that two particular parts of the brain communicate: the amygdala and the prefrontal cortex. The amygdala is considered the brain's emotion center, and the prefrontal cortex the "command and control" part of the brain. In healthy individuals, these two areas are in constant communication, with our emotions continuously interacting with our analytic, deliberate thought; the ways these areas fire messages from one to another regulate everything from the ways we interact in social situations to how we learn.

*"Optogenetics, as a field, is racing forward, and our research is helping propel it to domains that were until recently out of the reach of common research techniques," says Dr. Yizhar. "It is giving us the opportunity to observe and work with the brain in ways that have never before been achieved."*

The group has not only uncovered a great deal about how the neural networks operate, by actually seeing them light up in the context of certain activities; it has also learned how to literally fine-tune behaviors in the process. For example, they found that they could actually control a memory (in this case, a




*Neuron expressing channel rhodopsin (green) being recorded using a glass micropipette*

fear response) after it was learned. Dr. Yizhar and his group are finding that the brain's learned fear response can be ratcheted down by optogenetic tuning of the connections between the amygdala and prefrontal cortex. By doing so, they are discovering exactly where and how the lines of transmission run between these two parts of the brain. Their findings may have relevance for post-traumatic stress disorder, which involves a similar sort of "learned" fear response.

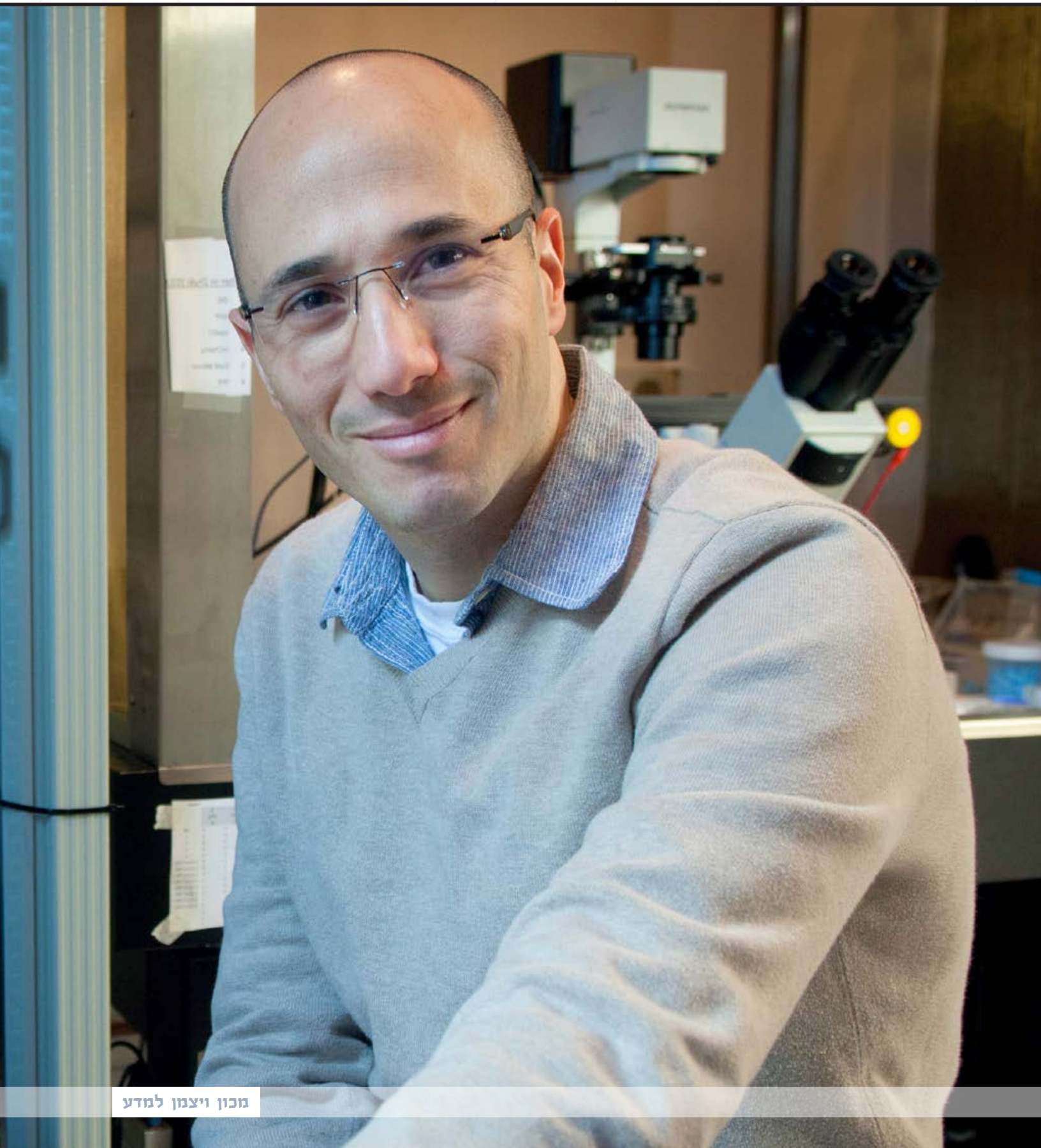
The field of optogenetics has far-reaching implications for many other brain disorders and diseases that are treated today with talk therapy and/or drugs, which often are only partially effective, at best. "Many psychiatric disorders involve an inability to function in social situations," says Dr. Yizhar, "and we think that missed connections within and between these two areas may often be to blame."

To recognize what goes wrong in such diseases, one must first understand how communication occurs in the healthy brain, and several studies underway in Dr. Yizhar's lab address this. For example, he is investigating how the amygdala and the prefrontal cortex coordinate during interpersonal interaction. In these experiments, Dr. Yizhar and his team developed a method for "tuning" the optogenetic switch so that it could "turn on" or "turn off" specific nerve cell signals. The mice were then exposed to various cues—another mouse of the same or opposite sex, smells, or images—and the signaling of their neurons was recorded.

Once the normal patterns become apparent, says Dr. Yizhar, he compares them with those of mice that are genetically engineered to have mutations known to exist in such human disorders as schizophrenia or autism. The research is beginning to reveal the innards of what has been up until now a black box: how such mutations affect the nerve cells' lines of communication. That has involved mapping the connections between neurons in the prefrontal cortex in normal and diseased mice—both their physical location and strength. This mapping project is done in real time in Dr. Yizhar's lab, as the experimenter controls the light signal, and thus the neurons, from his computer screen.

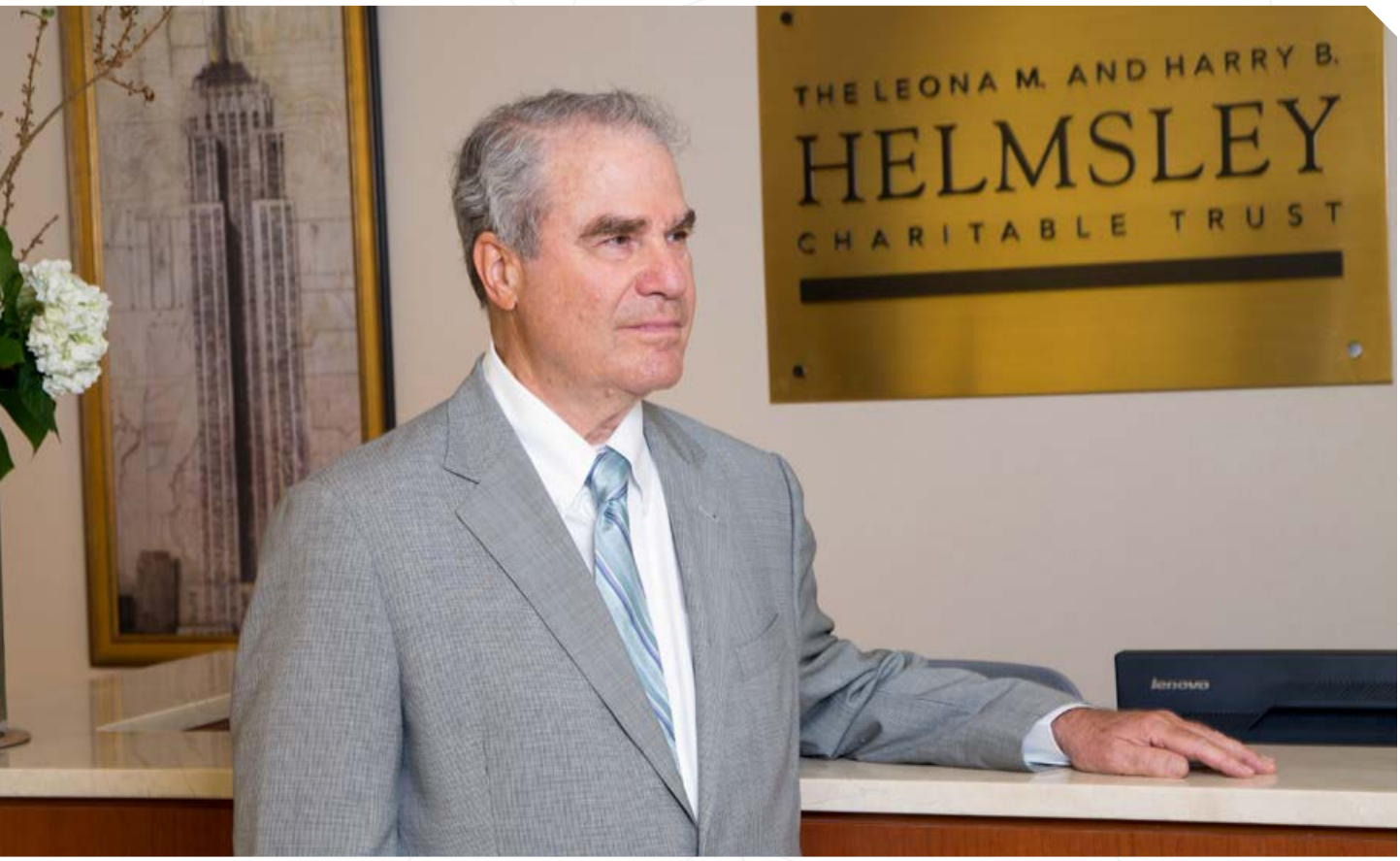
How far have we come from electrodes? Actually, quite a distance. "If we once conducted these experiments by inserting two electrodes—a process that took several hours—and then spent days recording the signal between just one pair of neurons, we can now use our tiny lasers to map out these signals within minutes," says Dr. Yizhar.

Time efficiency is just one advantage. The knowledge gained is the expected key watershed from this line of research—opening the door to understanding the intricate wiring of the brain, the effect of disease-causing genes on the neuronal circuits, and cognition and behavior in health and disease.



מכון ויצמן למדע

# Q&A with Sandor Frankel of the Helmsley Trust




"I'm just a guy from the Bronx," says the lead trustee of the Helmsley Charitable Trust's Israel Program, who, with his co-trustees, gives away multi-millions to Israel every year in his "dream job."

Sandor (Sandy) Frankel, 71, is one of four trustees of The Leona M. and Harry B. Helmsley Charitable Trust, personally overseeing its Israel and Crohn's/Inflammatory Bowel Disease programs. He is a practicing attorney who represented Leona Helmsley, the hotel owner and real estate magnate from New York, for 18 years before her death in 2007. She established the Trust during her lifetime, and directed that, upon her death, her entire estate be liquidated and the proceeds contributed to the Trust. She gave her trustees full discretion as to the charitable uses of the funds, which currently total well over $5 billion—in addition to the more than $1.5 billion in grants already awarded. The four trustees—two of Mrs. Helmsley's grandsons, a former business associate of hers, and Mr. Frankel—work together to choose the beneficiaries of funding for exceptional non-profits around the world.

In addition to the Israel and inflammatory bowel disease program areas, the Helmsley Trust gives to a wide variety of beneficiary organizations and institutions, in the fields of education, diabetes, rural healthcare, children-at-risk, and beyond. Under Mr. Frankel's leadership, Israel has become a

# Q&A



major beneficiary, with dozens of entities receiving major funding. The Trust's relationship with the Weizmann Institute began in 2010, and has provided transformational funding for research related to Crohn's disease, stem cells, and alternative energy sources totaling $23.1 million for six grants. Mr. Frankel sat down with *Weizmann Magazine* to talk about the Trust's commitment to Israel and its gifts to the Weizmann Institute.

**Q Why does the Trust give so widely to Israel?**

**A** Although Mrs. Helmsley, who was Jewish, didn't give to Israel during her lifetime, I think she would be pleased to know that her money is being wisely spent there. We have given a total of $151 million to Israel so far, because the opportunities for making an impact in Israel are so great. Not because Israel is 'needy' but because there is so much important work going on there, which more funding could simply take to the next level.

The four trustees have diverse philanthropic interests, though none of us had experience in philanthropy beforehand. I spent my career as an attorney and enjoyed my work, but this job is truly a dream. Sometimes I need to pinch myself because I'm in a position to help the Trust give away money and to do real good in areas that I care about.

When it comes down to it, I'm just a guy from the Bronx who cares about Israel as the homeland of the Jewish people. My wife is a *sabra*. Israel is a bastion of democracy in a troubled region of the world—a modern-day miracle that continues to flourish despite all odds. I truly believe that the development and security of Israel leads to the development and security of the world. And so investing in Israeli science and technology is a privilege and an opportunity to be part of this fantastic and important story.

**Q Why Weizmann?**

**A** Grants to the Weizmann Institute are a pretty good bet. You know you are investing in the best brains in the world. We know the funds are being

ISRAEL WAS ESTABLISHED 67 YEARS AGO TODAY.
THROUGHOUT THOSE YEARS, THE UNITED STATES AND ISRAEL
HAVE BEEN PARTNERS IN DEMOCRACY, THEIR PEOPLE
BOUND BY COMMON VALUES AND INTERESTS.

THE DECLARATION
OF THE ESTABLISHMENT OF THE STATE OF
ISRAEL

The Land of Israel was the birthplace of the Jewish people. Here their spiritual, religious and political identity was shaped. Here they first attained to statehood, created cultural values of national and universal significance and gave to the world the eternal Book of Books.

After being forcibly exiled from their land, the people kept faith with it throughout their Dispersion and never ceased to pray and hope for their return to it and for the restoration in it of their political freedom.

Impelled by this historic and traditional attachment, Jews strove in every successive generation to re-establish themselves in their ancient homeland. In recent decades they returned in their masses. Pioneers, defiant returnees, and defenders, they made deserts bloom, revived the Hebrew language, built villages and towns, and created a thriving community controlling its own economy and culture, loving peace but knowing how to defend itself, bringing the blessings of progress to all the country's inhabitants, and aspiring towards independent nationhood.

In the year 5657 (1897), at the summons of the spiritual father of the Jewish State, Theodore Herzl, the First Zionist Congress convened and proclaimed the right of the Jewish people to national rebirth in its own country.

This right was recognized in the Balfour Declaration of the 2nd November, 1917, and re-affirmed in the Mandate of the League of Nations which, in particular, gave international sanction to the historic connection between the Jewish people and Eretz-Israel and to the right of the Jewish people to rebuild its National Home.

The catastrophe which recently befell the Jewish people – the massacre of millions of Jews in Europe – was another clear demonstration of the urgency of solving the problem of its homelessness by re-establishing in Eretz-Israel the Jewish State, which would open the gates of the homeland wide to every Jew and confer upon the Jewish people the status of a fully privileged member of the community of nations.

Survivors of the Nazi holocaust in Europe, as well as Jews from other parts of the world, continued to migrate to Eretz-Israel, undaunted by difficulties, restrictions and dangers, and never ceased to assert their right to a life of dignity, freedom and honest toil in their national homeland.

In the Second World War, the Jewish community of this country contributed its full share to the struggle of the freedom- and peace-loving nations against the forces of Nazi wickedness and, by the blood of its soldiers and its war effort, gained the right to be reckoned among the peoples who founded the United Nations.

On the 29th November, 1947, the United Nations General Assembly passed a resolution calling for the establishment of a Jewish State in Eretz-Israel; the General Assembly required the inhabitants of Eretz-Israel to take such steps as were necessary on their part for the implementation of that resolution. This recognition by the United Nations of the right of the Jewish people to establish their State is irrevocable.

This right is the natural right of the Jewish people to be masters of their own fate, like all other nations, in their own sovereign State.

Accordingly we, members of the People's Council, representatives of the Jewish Community of Eretz-Israel and of the Zionist Movement, are here assembled on the day of the termination of the British Mandate over Eretz-Israel and, by virtue of our natural and historic right and on the strength of the resolution of the United Nations General Assembly, hereby declare the establishment of a Jewish state in Eretz-Israel, to be known as the State of Israel.

We declare that, with effect from the moment of the termination of the Mandate being tonight, the eve of Sabbath, the 6th Iyar, 5708 (15th May, 1948), until the establishment of the elected, regular authorities of the State in accordance with the Constitution which shall be adopted by the Elected Constituent Assembly not later than the 1st October 1948, the People's Council shall act as a Provisional Council of State, and its executive organ, the People's Administration, shall be the Provisional Government of the Jewish State, to be called "Israel."

The State of Israel will be open for Jewish immigration and for the Ingathering of the Exiles; it will foster the development of the country for the benefit of all its inhabitants; it will be based on freedom, justice and peace as envisaged by the prophets of Israel; it will ensure complete equality of social and political rights to all its inhabitants irrespective of religion, race or sex; it will guarantee freedom of religion, conscience, language, education and culture; it will safeguard the Holy Places of all religions; and it will be faithful to the principles of the Charter of the United Nations.

The State of Israel is prepared to cooperate with the agencies and representatives of the United Nations in implementing the resolution of the General Assembly of the 29th November, 1947, and will take steps to bring about the economic union of the whole of Eretz-Israel.

We appeal to the United Nations to assist the Jewish people in the building-up of its State and to receive the State of Israel into the community of nations.

We appeal – in the very midst of the onslaught launched against us now for months – to the Arab inhabitants of the State of Israel to preserve peace and participate in the upbuilding of the State on the basis of full and equal citizenship and due representation in all its provisional and permanent institutions.

We extend our hand to all neighbouring states and their peoples in an offer of peace and good neighbourliness, and appeal to them to establish bonds of cooperation and mutual help with the sovereign Jewish people settled in its own land. The State of Israel is prepared to do its share in a common effort for the advancement of the entire Middle East.

We appeal to the Jewish people throughout the Diaspora to rally round the Jews of Eretz-Israel in the tasks of immigration and upbuilding and to stand by them in the great struggle for the realization of the age-old dream – the redemption of Israel.

Placing our trust in the Almighty, we affix our signatures to this proclamation at this session of the provisional Council of State, on the soil of the Homeland, in the city of Tel-Aviv, on this Sabbath eve, the 5th day of Iyar, 5708 (14th May, 1948).

Signed: David Ben-Gurion and 37 other founders of the State of Israel.

CONFERENCE OF PRESIDENTS
of Major American Jewish Organizations Fund

Made possible by a grant from THE LEONA M. AND HARRY B. HELMSLEY CHARITABLE TRUST

*In 2014 and again in 2015, the Helmsley Charitable Trust ran a full-page ad in several major U.S. newspapers with a reprint of the Declaration of the Establishment of the State of Israel to mark Israel Independence Day. "I'm very proud of this initiative because it is important to remind people about the miracle of the establishment of Israel and the bedrock principles of the country," says Mr. Frankel. "We can help play a role in reminding people once a year on Yom Ha'atzmaut, though they should really remember it every day."*

used productively, they are responsibly spent, and that we'll see real results in science. The research collaboration between the Weizmann Institute and the Technion in alternative energy set a high bar. But we know that basic research takes time and effort to bear results.

**A Why did you choose alternative energy research as one of your early philanthropic gifts?**

**Q** It was the choice of the Technion and Weizmann Institute, which have powerful teams in this area, in solar conversion and biofuel. We liked the idea that the strengths of each institution can be fused so that real progress can be made in this field. But ultimately what we invested in here were great minds. We don't write checks to test tubes.

**Q What other investments in Israel are you proud of?**

**A** There are many! But just for a taste: We recently funded the creation of the Jerusalem Press Club in a state-of-the-art facility in Yemin Moshe overlooking the Old City. We wanted a comfortable and suitable place for journalists to convene for press conferences and meetings, so they can learn about what Israel is, and accurately report on Israel. We have given to many medical centers, Taglit-Birthright, and are supporting the construction of a secure national blood bank for Magen David Adom.

I don't know what other country in the world has so many worthy causes and can generate so much excitement among philanthropists.

**Q What is your vision for Helmsley's Israel Program?**

**A** My vision is that the program will only grow in years and decades to come, and that the world will reap the benefits. We will never run out of good ideas that are worth investing in in Israel.

## Inflammatory Bowel Diseases and Crohn's

The Helmsley Charitable Trust funded a three-year research grant, followed by a two-year research grant, for research on inflammatory bowel diseases. Inflammatory bowel diseases are a diverse group of chronic disorders affecting the human gastrointestinal tract and related organs. Several million people worldwide suffer from these disorders, which include Crohn's disease and ulcerative colitis. Twelve research groups led by Prof. Benny Geiger of the Department of Molecular Cell Biology embarked on a wide range of interdisciplinary studies designed to present new perspectives and spark innovation in the field. Helmsley Trust support has helped Weizmann Institute researchers form new collaborations with clinicians, initiate joint studies with industry, and publish dozens of research papers in top journals describing new finds. These developments have placed the Weizmann Institute at the cutting edge of international research in Crohn's and inflammatory bowel diseases. Prof. Geiger and Dr. Eran Elinav of the Department of Immunology are now developing unique and clinically relevant IBD models.

A major grant helped equip a new laboratory for the study of immunology and inflammation: the lab of Dr. Elinav. With an MD in internal medicine and a PhD from the Weizmann Institute in 2009, Dr. Elinav has brought extensive clinical experience to the bench and is making key advances in the understanding of IBD, metabolism, and metabolic disorders. His Personal Nutrition Project, which he is undertaking with Prof. Eran Segal of the departments of Molecular Cell Biology; and of Computer Science and Applied Math, is revealing intriguing insights about individuals' specific responses to food, with implications for weight control and disease prevention.

# Helmsley Charitable Trust grants to the Weizmann Institute



## Stem Cell Research

A multi-million-dollar "Tapping the Regenerative Power of Stem Cells" research program funded by the Trust helped launch Dr. Jacob Hanna of the Department of Molecular Genetics, an MD/PhD and a world leader in stem cell research, and support a broad coalition of stem cell researchers. Funds supported equipment in his lab. Over the three years of Helmsley support in this field, Weizmann Institute scientists discovered a number of checkpoints in the process of reprogramming adult cells into induced pluripotent stem cells. The most dramatic finding demonstrated that removing a single protein from adult cells lifted a major roadblock to the efficient production of stem cells—enabling nearly 100 percent of the cells to complete the reprogramming process in about eight days, compared to previous success rates of about 1 percent achieved over the course of several weeks.

They generated the first "humanized" mouse models containing human-derived tissues and developed more than 30 genetically modified animal models for stem cell study. Scientists also demonstrated the potential for cell therapy using human mesenchymal stem/stromal cells, as well as refining the use of cell reprogramming to reduce rejection in bone marrow and other transplanted tissues.

## Energy Research

With another transformational grant, the Helmsley Charitable Trust seeded a three-year collaboration between the Weizmann Institute of Science and the Technion-Israel Institute of Technology on energy research. Called "New Options for Solar Energy Conversion to Biofuel and Electricity," the research program aimed to improve performance of solar cells and solar-driven biofuel production and find new sources for biofuel crops that would not compete with existing food production. Projects included basic research and engineering of advanced optics to improve solar light harvesting and quantum solar energy conversion. The project, unprecedented in scope in this field in Israel, produced research advances in a new class of solar cells; substantial progress in alternative biofuel sources and methods for turning algae and plant wastes into fuel; and improvements in the efficiency of solar cells.

## Magnetic Resonance Research

Another multi-million-dollar grant, over two years, funded a project entitled "Increasing the Power of Magnetic Resonance," centered around research led by Prof. Lucio Frydman of the Department of Chemical Physics. This includes partial funding for purchasing one of the most powerful MR instruments in Israel. The Weizmann Institute has since recruited several new young scientists whose research requires the use of MR—individuals who might otherwise have opted for positions at other institutions. The Institute is rapidly expanding its capabilities in this area, which is poised to affect numerous areas of life sciences and materials science.

# Student mission to the U.S.

In March, the American Committee for the Weizmann Institute of Science welcomed six inspiring graduate students from the Institute's Feinberg Graduate School (FGS) for a series of meetings with supporters and friends. Three students, accompanied by Feinberg's Academic Secretary Dr. Ami Shalit, visited New York and Florida, while three others traveled to California with Prof. Ari Elson from the Department of Molecular Genetics. At luncheons, dinners, and intimate gatherings, the students shared their passion for science and their experience of pursuing research under the guidance of world-renowned experts.

The students described the appeal of the Institute's collaborative, curiosity-driven atmosphere. "When I was considering where to study for my master's degree, I had the chance to spend two weeks on campus," recalled Shira Weingarten-Gabbay. "By the end of those two weeks, it was clear to me that I would do anything to be accepted to the Weizmann Institute."

While their focus areas vary—ranging from heart regeneration to alternative energy to personalized cancer therapy—each student expressed passion for modern science. "These students are young, dynamic, and enthusiastic," said Dr. Shalit. "They have a dream and they are determined to get there." He called Feinberg students "the lifeline" of the Weizmann Institute, as they are poised to become the scientific leaders of tomorrow.

# Belgian delegation to campus

Fondation Weizmann.be pour la science (Belgian Society of Friends of the Weizmann Institute, chaired by Mr. Christian Hendboeg) and Bank Degroof, Belgium's premier privately owned investment bank together with the European Committee of the Weizmann Institute of Science, hosted 25 influential business leaders from Belgium on campus in May. The two-day program emphasized

Institute advancements in personalized medicine, cancer research, brain research, computer science, environmental science, and physics.

Baron Alain Philippson, Chairman of Bank Degroof and Head of the Delegation, said, "I have been a supporter of Israel for 40 years and am now one of the Weizmann Institute, and for me it is important and exciting to see the investment in research for the benefit of humanity."

Among the delegation's participants was Mr. Jean-Marie Solvay, President of the International Solvay Institutes. "What has come through loud and clear to me is how at the Weizmann Institute, research is driven by curiosity and the freedom to think and explore creates a successful research culture," said Mr. Solvay. "Witnessing this first-hand confirms to me that the Institute has the right approach to science and the results are obvious."

"Visiting the Weizmann Institute was a wonderful experience of learning about what science can do for mankind and a better future. Apart from this, it is all about people, and the people we met at the Weizmann Institute are certainly special," says Claude Kandiyoti, CEO of Krest Real Estate Investments.

# Weizmann World



## Dr. Jacob Hanna in Sydney

Stem cell research was the topic at hand on May 13 in Sydney, when Dr. Jacob Hanna spoke at the Victor Chang Cardiac Research Institute, an event hosted by Weizmann Australia. Dr. Hanna, a member of the Department of Molecular Genetics, spoke to a full lecture hall of scientists. The event was followed by a dinner party with a group of Weizmann Institute friends and Weizmann Australia board members at the home of Weizmann Australia board member Matthew Nurick. Dr. Hanna captivated his audience with descriptions of his work.

## Weizmann UK mission

In mid-June, Weizmann UK brought a new generation of UK professionals active in philanthropy to the Weizmann Institute campus for a three-day mission. The participants included professionals from the realms of finance, law, and accountancy.

The group received a warm welcome from President Prof. Daniel Zajfman. The group was joined by British postdoctoral fellows, and spent time at the Clore Garden of Science. They learned about other UK-supported work at the Wohl Institute for Drug Discovery and the Dangoor Research Accelerator Mass Spectrometry Laboratory, and saw other sites historically funded by UK support.

The group met scientists from a variety of areas from plant sciences to neurobiology to cancer research, and did sightseeing in Tel Aviv and Jerusalem. Tamar Galai-Gat, Executive Director of the Clore Israel Foundation, joined the group in Jerusalem and presented an overview of the Foundation's support for both the Weizmann Institute and across Israel.

The mission closed with a dinner at Regina Restaurant, where they were joined by Prof. Benjamin Geiger from the Department of Molecular Cell Biology and Dr. Kobi Abramson of the Department of Immunology.

Reflecting on her time on campus and in Israel, mission participant Deborah Sayagh said, "The visit far exceeded my expectations of what I thought I would learn and understand: the passion of the scientists really comes out and it's easy to get excited as they describe their journey." Clement Hutton-Mill said he was already looking forward to his next visit and said he "hopes to be able to bring others too, as everyone should know about the Weizmann Institute."

# New President for Mexican Association

Martin Kushner stepped down from his position as President of the Mexican Association of Friends after many years of committed service in a ceremony held in Mexico City on June 16. Throughout the years, Mr. Kushner helped expand the Institute's network of friends in Mexico. He passed the torch to Martha Flisser, who is highly active in the Mexican Jewish community and possesses a deep commitment to Israel, and Israeli science. The ceremony took place at the residence of the then-Israeli Ambassador to Mexico, Dr. Rodica Radian-Gordon. More than 100 friends and important community leaders were in attendance.

**L to R:** *Martin Kushner, Dr. Rodica Radian-Gordon, and Martha Flisser*

# WeizmannVibe: music and science

About 160 members of the Israeli Friends' Young Science Club met in June at the home of Noga and Roy Oron. Weizmann Institute President Prof. Daniel Zajfman spoke at the event about the "business of science". The event also featured a performance by Iki Levy and the 'Rasta Hebrew Man'.

The Young Science Club is supported by Bank Hapoalim (Switzerland) Ltd.

# Amos Oz speaks to Israel Friends

Renowned Israeli author Amos Oz spoke at a gathering of the Israeli Association of Friends of the Weizmann Institute of Science at Cinema City in Ramat Hasharon on August 30 about his 2002 book, *A Tale of Love and Darkness,* which served as the basis for the newly released movie of the same title. The movie was screened for the more than 250 members of the Association.

In the movie, directed by and starring Natalie Portman, the Israeli-American actress plays Oz's mother in a storyline that draws elements from his own childhood in Jerusalem. Oz's mother committed suicide when he was twelve years old. He described a collective trauma of the Holocaust that existed throughout his upbringing and which affected the next generation. In order to survive, he said, he wanted to be a book—because the written word, unlike people, do not die.

According to Oz, Portman chose elements from his book "sensitively, with deep understanding and with a lot of talent".

Oz said that he expressed a lot of anger after losing his mother but throughout the years he developed "curiosity, compassion and empathy for, and humor about" his parents and tried to explore how the lives of good people like his parents can have such tragic outcomes.

The author, who received an honorary PhD from the Weizmann Institute in 2006, said that since then, he has become "part of the family of the Weizmann Institute."

# The Art of Personalized Medicine

A new art exhibit entitled "Medicine and Medication in Contemporary Art," is on display in the lobby of the new Nancy and Stephen Grand Israel National Center for Personalized Medicine on campus. Launched on July 1, the exhibit includes the works of artists from Israel and England. Shown here (top right) is a painting by Eric Bokobza, who trained as a pharmacist and who focuses on chemical formulas for drugs, which he then ties to a physical place: Jerusalem. Artist Iris Irisya Kovalio's painting (bottom right) appears on the packaging of drug *Algolysin Forte*. Below: Artwork showing the world on a capsule by Tamar Sheaffer, formerly a software developer who has held senior positions in Israel's security industry.

# Wonderful Women in Canada

Weizmann Canada's Women and Science Committee hosted its annual Wonderful Women event in Toronto on April 28 with more than 250 guests in attendance. Dr. Hagar Landsman of the Department of Particle Physics and Astrophysics spoke on the five-woman panel. Proceeds raised from the event were earmarked for two fellowships for the Israel National Postdoctoral Program for Women in Science.

Pictured from left to right: Dr. Landsman; Beth S. Horowitz, Former President & CEO of Amex Bank of Canada, and Former President & General Manager, Amex Canada, Inc.; Marnie McBean O.C., Decorated Olympian, Specialist in Olympic Athlete Preparation and Mentoring; Lainey Lui, Co-Host of CTV's THE SOCIAL, Reporter for ETALK, Gossip Blogger and Author; Pattie Lovett-Reid, Chief Financial Commentator, CTV News, moderator of the event.

# Google CEO on the secret of Israeli innovation

If a member of the Weizmann Institute community was curious as to what the CEO of Google thinks of Israeli high-tech and entrepreneurship, there was no need to "google it"—hundreds came to hear Eric Schmidt in person at Wix Auditorium on June 7, where he sang the praises of Israel's culture of innovation.

"Israel is thriving in terms of innovation because you have a culture that makes it possible to question authority and to challenge everything. You don't follow the rules." said Mr. Schmidt. "The influence that Israelis have on science and technology is tremendous; that's why I'm here, and that's why I invest here." He was on campus with executives of the investment firm he heads, Innovation Endeavors, which is highly active in Israel.

He went on to say that the best inventions in modern history have been made by individuals who "did not accept what is dogma and tried to do something different." The most important developments at Google, he said, like Google Maps, Google Translate, and Google Voice Search, were done in a "totally outside-the-box" fashion, not relying on accepted methods. The company's Project Loon, he added, is the epitome of such thinking. Project Loon is a network of balloons traveling on the edge of space; the project aims to provide Internet access for the fully two-thirds of the world's population currently without Internet access.

Curiosity-driven basic research of the kind pursued at the Weizmann Institute, he said, is critical to developing tools that improve lives. The creative minds that are thinking and dreaming about what's possible in the future—things that seem like science fiction today, like self-driving cars and computers which can "think" like humans—are poised to be the leaders in science in industry in the years to come.

# Weizmann Institute ranked 10th in world for research impact

In the highly regarded Leiden University ranking of scientific research impact, the Weizmann Institute of Science was ranked tenth in the world for research quality, in a study released in July. The Institute was the only institution outside the U.S. to make the top ten.

The survey is based on citation data of published papers, not subjective questionnaires. The ranking was conducted by the Centre for Science and Technology Studies at Leiden University in the Netherlands, known by the Dutch acronym CWTS. The study analyzed 750 research institutions worldwide in the years 2010-2013.

The ranking reflects a marked growth in impact of Weizmann Institute of Science research, which was ranked 19th on the Leiden list in 2006.

According to CWTS, Weizmann Institute scientists published 2,414 scientific articles in the study period, and these articles were cited 27,859 times. Of these articles, 460—or 19 percent of the total number of articles the Institute published in this period—were among the top 10 percent of all articles published worldwide in terms of their impact, as measured by the number of times they were cited.

In life sciences and medicine, the Institute ranked particularly high: 21.4 percent of its articles made it into the top 10 percent in terms of impact. And 57 articles made it into the top one percent in terms of impact—meaning, they were among the most influential articles published worldwide.

The full ranked list is available at www.leidenranking.com/ranking/2015

## Top ten institutions:

1. Massachusetts Institute of Technology
2. Harvard University
3. Stanford University
4. University of California-Berkeley
5. Princeton University
6. Caltech
7. University of California-Santa Barbara
8. University of California-San Francisco
9. Rice University
10. **Weizmann Institute of Science**

# Visit with the President of Uruguay

Director for External Affairs for Latin America, Dany Schmit, met with Uruguay's President, Dr. Tabaré Vázquez, in August in Montevideo. Dr. Vazquez is an oncologist who was a visiting student in the lab of the late Prof. Nathan Trainin. The two discussed possible collaborations in cancer research between the Weizmann Institute and institutions in Uruguay. Dr. Vazquez was last in Israel in 2008 on an official visit during his first term as President; he is currently serving his second term. On that visit, he toured the Weizmann Institute.


*Hilda Lewis and son Robert Lewis next to a plaque acknowledging the giving of Hilda and her late husband Cecil*

# Hilda Lewis and Prof. Benny Shilo

On the occasion of Hilda Lewis' 90th birthday, she looked back on her many years of philanthropy for, and friendship with the Weizmann Institute, most of which were carried out in partnership with her late husband Cecil, who passed away in 2005. It is a legacy that has continued with her children, Robert Lewis and Cathy Wills. The family resides in London where *Weizmann Magazine* interviewed Hilda.

The professorial chair she and Cecil established in 2002, the Hilda and Cecil Lewis Professorial Chair in Molecular Genetics, led to a close friendship with Prof. Ben-Zion Shilo. Although the couple gave generously to many areas at the Institute, it may have been the one that Hilda most enjoyed because of the friendship that developed around it.

The couple also established the Hilda and Cecil Lewis Solar Laser Development Laboratory and contributed to the Center for Experimental Physics. They created a student scholarship, and supported students from the former Soviet Union soon after they

# Profile of a Pair



arrived in Israel in the 1990s. In recent years, Hilda has given generously to the research of Prof. Eran Segal, who has a joint appointment in the Department of Molecular Cell Biology and the Department of Computer Science and Applied Math.

The Lewises, who are from the UK, began their relationship with the Weizmann Institute in the late 1980s, and Cecil was elected to the International Board (then the Board of Governors) in 1989. For years, they were regular attendees of the annual Board events. In 2003, the Institute was to have recognized Cecil with an honorary PhD, but he fell ill and could not travel to Israel to receive the honor. Hilda received an honorary PhD in 2009. Driving the duo, always, was their commitment to Israel and the Jewish people, and to science.

Cecil was "a great intellectual and interested in everything," says Hilda. "Archaeology was one of his greatest passions and it was this that led him to want to fund science and academic study."

*Prof. Dan Yakir (right) with Robert Lewis*

The Lewises gave generously to many institutions and organizations in the U.K. and Israel, but the Weizmann Institute has always been close to their heart, and continues to be close to Hilda's—even ten years after her husband's passing. "Why Weizmann?" Hilda asks rhetorically. "Because there is nobody who does what they do. I am enormously proud to have been part of the Weizmann story. The scientists do a wonderful, important job."

"I have been so fortunate to live a remarkable life full of philanthropy," she continues. "I wanted my children to know about Israel and the Institute and to be part of it. It was important to me that that I could pass this down through the generations to my children and I hope that my grandchildren will also get involved with Weizmann." One of her best memories, she says, was her induction into the President's Circle in Chicago in 2007, which she attended with son Robert.

It was then that Robert became interested in the research of Prof. Dan Yakir of the Department of Earth and Planetary Sciences, who investigates forests and climate change; he and his sister have since given generously to support Prof. Yakir's research. In 2012, Cathy, who is an art curator, managed a large exhibition of artwork from around the world at the then-new David Lopatie Conference Centre, with great fanfare.

*Hilda with Prof. Shilo in London*

"It is a true pleasure to know Hilda," says Prof. Shilo. "She has an open and adventurous spirit and is always looking for new excitements. My interactions with her over the years, during her visits to the Weizmann Institute or my visits to London, were always very personal and warm, and most of all filled with a lot of fun and laughter. The Lewis Chair provided me not only with support for my research, but also with a close connection to a wonderful, warm family which I came to know well over the years."

# Gil Blander: Bringing them home

It has always been the essence of the Israeli dream: to educate the country's scientific brainpower, which will drive the country's economy and ensure it is intricately connected to the West. That is indeed happening. Now, the task at hand is more nuanced: to bring back to Israel the best and brightest Israeli scientists among the burgeoning number of Israelis living and working abroad—mainly in North America—and at the same time ensure that those who stay overseas remain tightly connected to a global network of Israeli scientists which, ultimately, contributes to the strengthening of Israeli academia and industry.

For Dr. Gil Blander, the subject has been top-of-mind since he started his postdoctoral fellowship at MIT in 2002, after receiving his PhD at the Weizmann Institute under the guidance of Prof. Moshe Oren in the Department of Molecular Cell Biology. At MIT, he met Prof. Eldad Tzahor who had just completed his postdoc and was headed to a new position at the Weizmann Institute. Prof. Tzahor handed him a list of some 50 names of Israeli postdocs in Boston.

# Alumni



All were either actively searching for positions in Israel or were considering returning—as long as they found the right job.

Dr. Blander held onto that list, and took it upon himself to update it on an ongoing basis. He remained in Boston after his postdoc and founded a company called Inside Tracker where he is now Chief Scientific Officer and President. Inside Tracker, based in Cambridge, MA, offers science-driven nutrition and lifestyle interventions which are based on sophisticated algorithms that track and analyze key biochemical and physiological markers in individuals.

"I have built my life and career in Boston but, like many Israelis in the life sciences here, the hope of moving back to Israel has always remained with me," says Dr. Blander. "The fact that Israeli universities and companies are looking to fill positions with people who have had experience in the U.S. and Canada, in combination with the fact that so many Israelis in the life sciences are considering and hoping to return to Israel, exposed a real need to make matches between people and jobs."

So, in 2006, together with friends Dr. Shmulik Hess, then a postdoc at MIT, and Rami Lotem, the husband of another MIT postdoc fellow, Dr. Blander started BioAbroad to respond to this need. It started off as a consortium of Israelis working in the life sciences in Boston—postdocs, physicians, and scientists in academia and industry—and offered networking opportunities, small job fairs, lectures by Israeli scientists visiting in Boston, and informal discussion groups. Today, nearly a decade later, BioAbroad has a presence in 20 cities in the U.S. and Canada, with two paid professionals and a bevy of volunteers who operate both social activities and professional ones; about 1,800 people in all have been involved in BioAbroad events. With funding from a small number of individuals and annual support from Israel's Ministry of Immigrant Absorption, the IAC (Israeli-American Council), and major universities in Israel including the Weizmann Institute, the organization offers travel grants for Israeli scientists to fly to Israel for job interviews.

A nonprofit organization, BioAbroad aims to strengthen research and industry in Israel by maintaining a worldwide network of Israeli scientists, physicians, and entrepreneurs, and, says BioAbroad CEO Monika Lev Cohen, "encourages them to move back to Israel to use their expertise to advance Israeli academia and industry".

Success is tricky to measure. Of the approximately 100 recipients of such fellowships over the years, some 70 percent are in positions in Israeli academia or industry. But thousands of Israelis have had some kind of touchpoint with BioAbroad, many of whom have returned to positions in Israel. Moreover, says Dr. Blander, "Building a strong network of Israeli scientists across America—people who stay in America and are well-connected—is essential for the success of Israeli science. So even though BioAbroad was started in order to help those who wanted to return to Israel, in fact it serves a second purpose of strengthening the network abroad. That isn't any less important."

At the same time, Israeli institutions and companies "know that they can come to us when they are looking for talent," he adds.

This year, BioAbroad launched an excellence award for a young postdoc working in North America, which will be given in a ceremony at the annual gathering of the Israel American Council in Washington D.C. "The idea," says Dr. Blander, "is to give a badge of honor to a young scientist, which will help draw attention to that person as a rising star, and to Israeli scientists in America in general."

Early BioAbroad funder Yehuda Zelig, Senior VP of Biorest Ltd., says, "I believe that the most important asset of the State of Israel is its talented and brilliant youth, some of whom are residing abroad and aspire to return to Israel when they complete their training overseas. The country and its people and institutions must do everything in their power to bring them back home. This initiative, to consolidate and institutionalize such efforts, should be highly valued and supported by those who care about Israel's future."

# Prof. Rava Azeredo da Silveira

*On perception—and some perceptions of Israeli science*

Even in a globalizing world, it is not every day that you encounter a global citizen and scholar like Prof. Rava Azeredo da Silveira. Born and raised in Switzerland to a Brazilian father and an Iranian mother, he obtained his PhD in theoretical physics at MIT and worked as a junior fellow at Harvard University. Yet he continues to travel and work as a visiting scientist in various places, including Princeton University and the Weizmann Institute of Science, while maintaining a working lab in the École Normale Supérieure (ENS) in Paris.

But Prof. da Silveira is not only a geographical wanderer; he also enjoys "traveling" from one discipline to the next. Although he started as a theoretical physicist, he currently works in the field

# Visiting Scientists



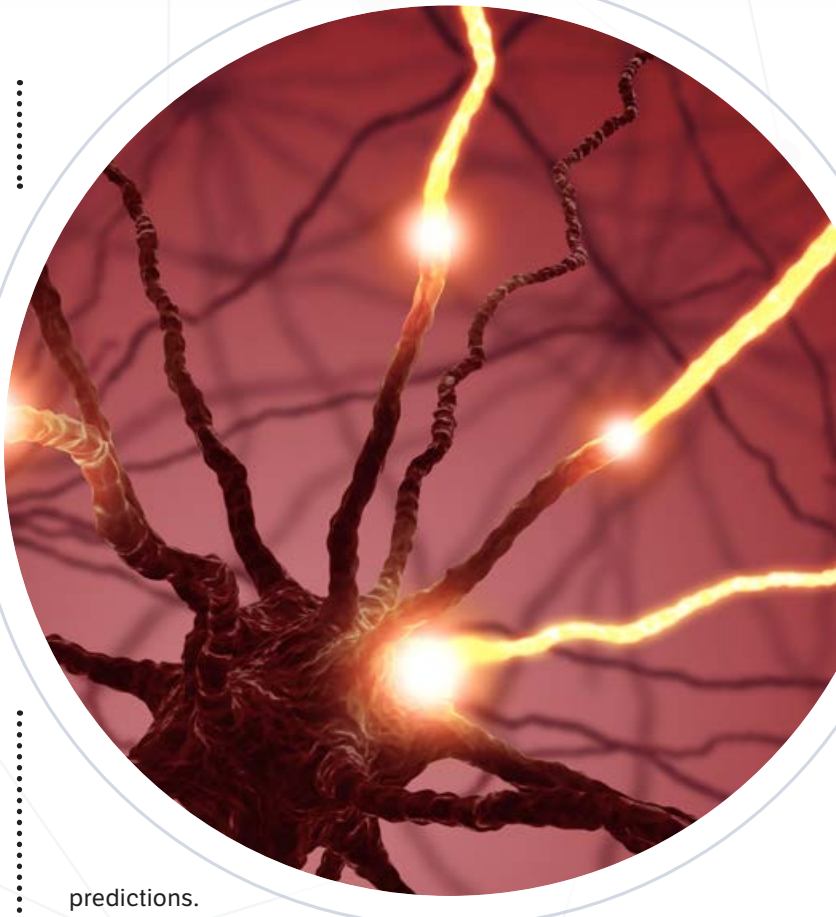
of computational neuroscience, which he is very passionate about. His research encompasses the three different levels of analysis typically addressed in neuroscience: the molecular or single cell level, the network level, and the behavioral level of a whole organism. Unlike scientists who follow a certain path of inquiry throughout their career, Prof. da Silveira claims that he is "impressionistic" in that he has been "motivated by diverse and broad conceptual themes rather than by trying to find ways to apply old tools to new questions," he says.

Prof. da Silveira served as a visiting scientist with the research group of Prof. Michail Tsodyks of the Department of Neurobiology for a little over two months, and also spent four weeks at the Hebrew University of Jerusalem, earlier this year. "I enjoyed every minute of my time in Israel... I love the streets of Israel and I love Weizmann," he says, adding that in particular he is attracted to "the people and the authenticity of their interactions." As a Baha'i, he had visited Israel in the past to see the Baha'i holy sites and has returned for professional visits twice since, including his latest stay.

## Neuronal basis of perception and expectation

Part of his current research focuses on neuronal network mechanisms involved in sensory perception, both in the retina and the brain. He explores how these networks acquire their specific function and characteristics. He also studies how the brain is able to precisely represent information and "make sense" of the activity of complex networks of neurons that compose it.

His most recent research, however, developed largely during his time in Israel, deals with how the brain develops behavioral expectations based on sensory input. People receive only limited information through the senses, yet they construct and maintain a model of the world in the mind, which allows them to make predictions on what to expect from the world and from their actions. He is elucidating this inference process through which the brain builds this expectation model and generates predictions. His work with Prof. Tsodyks will continue from afar. For now, their work is purely theoretical, but it may lead to behavioral experiments with the aim of testing their hypothesis on human subjects.



*Neurons showing electronic pulses transferring information in the brain*

One of the things that made Weizmann appealing to Prof. da Silveira is the unique campus atmosphere. The high level of scientific research combined with the small scale of the facility makes Weizmann fertile ground for innovative and cross-disciplinary ideas, and the informal yet well-managed environment allows for positive interaction and stimulating debate at all levels. This is especially true for students, who "are invested in and care about science and enjoy greater freedom to criticize and debate ideas" than they would in perhaps any other place in the world.

# Students

## Dr. Merav Parter: Having faith in math

If you want to devote your life to the study of math, says Dr. Merav Parter, "you have to be a little irrational." Dr. Parter, who received her PhD in the spring from the Department of Computer Science and Applied Mathematics, says that with a clear sense of irony.

"Real breakthroughs in any field are rare, and if a scientist or mathematician is lucky, he or she will have one really good discovery in the course of his or her career. So working on a particular problem in math day after day, month after month, year after year isn't entirely rational," she says. "So one needs a bit of spirituality and faith to keep pursuing the solution to a problem that no one has ever solved before."

Dr. Parter, who studied under the guidance of Prof. David Peleg, Dean of the Faculty of Mathematics and Computer Science, is religiously observant—which, she says, "is helpful to me in creating order and patterns in my life, and in the faith it gives me." She also writes songs, and is a literature buff.

Her field is the topology of wireless communication: how wireless networks—for our phones, Internet, and other telecommunication methods—can function better, based on more sophisticated algorithms. Think eradication of dead zones, perfect reception from anywhere on earth to anywhere else on earth: this is what she and other mathematicians in this field are striving for.

"Merav was the kind of model student that any advisor dreams of having: full of energy, creative and extremely bright, fearless when it comes to entering new topics and mastering advanced and complex mathematical techniques, and at the same time pleasant and modest," says Prof. Peleg.

This summer, Dr. Parter moved to Boston, where she is doing her postdoctoral fellowship at MIT, in one of the world's top communications and engineering labs. She was one of the Feinberg Graduate School's most outstanding students and the FGS graduation ceremony's student keynote speaker. She received

the prestigious Dimitris N. Chorafas Prize this year, the Google European Doctoral Fellowship in Distributed Computing, and the Dean's Award for Excellence for her MSc studies, among other honors. Her postdoctoral studies are supported by a Fulbright fellowship, a Rothschild fellowship, and the Israel National Postdoctoral Award for Women in Science offered by the Weizmann Institute.

### From industry to the bench

Dr. Parter, who grew up in Bat-Yam, and did her MSc at the Weizmann Institute in an altogether different field: bioinformatics, in the lab of Prof. Uri Alon of the Department of Molecular Cell Biology. She then worked for CheckPoint Software Technologies Ltd., one of Israel's most successful high-tech companies in the field of telecommunications security, as a software engineer. There, she says, "I learned about the practical needs in the field of electrical engineering. But I missed the academic environment. I had already tasted basic research at Weizmann, and had gotten used to the freedom of thought and exploration that it offered."

So she came back to the Institute for her PhD studies, but with a new focus: math. Like Prof. Alon, Prof. Peleg was an outstanding mentor. "David didn't give me answers," she says. "He asked me questions to which there are answers, and told me to approach them alone, as I thought best. Since then, when I have advised [masters'] students, I have tried to take the same approach. I tell them, 'Stop reading how everyone else tried to solve the problem. You may come up with something even better this way.'" That's an unsettling place for many students to be, but, she says, it's doable with just a little bit of irrational faith.

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