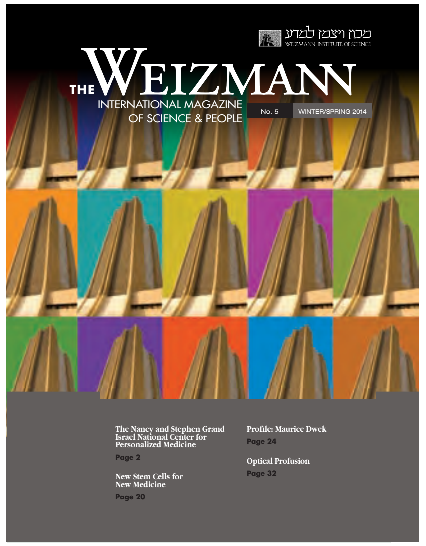
מכון ויצמן למדע
WEIZMANN INSTITUTE OF SCIENCE

# THE WEIZMANN

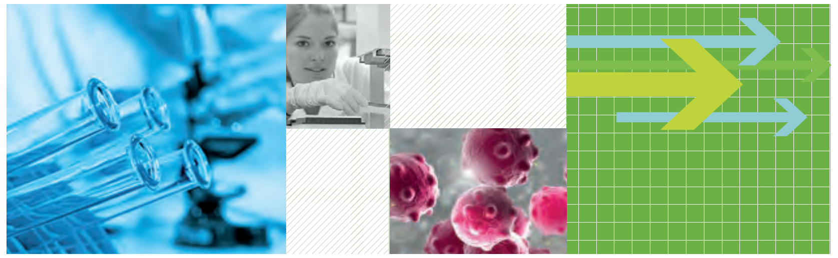
INTERNATIONAL MAGAZINE
OF SCIENCE & PEOPLE

No. 5 WINTER/SPRING 2014




*The Nancy and Stephen Grand Israel National Center for Personalized Medicine*
PAGE 2

## WeizmannDirect | *News from the Weizmann Institute*



**Just around the corner, the new Weizmann e-newsletter will appear in your inbox.**

*WeizmannDirect* will bring you news about the entire Weizmann Institute global family directly from the source. Stay up-to-date on the science and the people who make it happen – here in Rehovot and around the world.

**The Weizmann International Magazine of Science & People**
No. 5, Winter/Spring 2014



CONTENTS



## From the President

The future of the Weizmann Institute rests solely on the quality of the work that will be done by our scientists in the years to come. We have, over the past few years, been working to secure that future by bringing in a good number of outstanding new scientists - young men and women who have ingenuity and vision, and whose work places them on the frontiers of global science. Attracting and keeping scientists of this caliber obliges us to make significant investments, including infrastructure and equipment, as well as providing the financial resources that enable these scientists to concentrate on developing their scientific potential. Thanks to our friends around the world, we have been able to undertake these investments and, in doing so, shape the future of the Institute for decades to come. Thus we are ensuring that the innate excellence that has always characterized the Weizmann Institute will continue to do so in the future.

Significant developments are taking place right now at the Institute in a number of fields: brain research, cancer research, nanobiology and bioimaging. Of course, the Nancy and Stephen Grand Israel National Center for Personalized Medicine will soon be taking center stage for many campus research groups. Our extra efforts in these areas will ensure that our scientists can continue to conduct their research at the cutting edge of global science. Here too, our many generous friends around the world are stepping up to help.

The Weizmann Institute enjoys a very positive reputation on the international scientific scene; this is mirrored in the growing multicultural milieu on campus. Despite boycott rumblings, the past year has seen a significant rise in the number of foreign postdoctoral fellows coming to complete their training at the Institute. This reflects not only the Institute's standing in the world but the possibilities it offers to foreign researchers; because the choice to spend a year or so in Israel is not a trivial one. Another sign of our healthy reputation: There has been a substantial rise in the number of international conferences hosted in the Lopatie International Conference Centre.

We hope to see you in the spring at the Global Gathering in New York. There, together, we can focus on the task at hand - shaping the future of the Weizmann Institute of Science.

*Daniel Zajfman*

# The Nancy and Stephen Grand Israel National Center for Personalized Medicine

The Weizmann Institute of Science has established on its campus the Nancy and Stephen Grand Israel National Center for Personalized Medicine, an integrated core facility that provides state-of-the-art research capabilities and expertise in several modern technologies: genomics, protein profiling, bioinformatics, and drug discovery. These research platforms are critical for today's biomedical studies but are not commonly available in Israel.

The naming of the Center came in November, following a magnanimous gift by Nancy and Stephen Grand of San Francisco.

Prof. Daniel Zajfman, President of the Weizmann Institute, said that "Stephen and Nancy Grand's extraordinary gift, together with those already received from the Center's supporters, is a rare example of the Institute's friends coming together to achieve a vision that will profoundly influence the future of biomedical research. Because the Center serves the entire Israeli research community, the effects of the studies conducted within its walls will be felt all over the country and well beyond its borders."

The Nancy and Stephen Grand Israel National Center for Personalized Medicine consists of four pillars, established thanks to the generosity of Institute supporters: the Crown Institute for Genomics, the de Botton Institute for Protein Profiling, the Ilana and Pascal Mantoux Institute for Bioinformatics, and the Maurice and Vivienne Wohl Institute for Drug Discovery.

The Center will serve the 5,000 members of Israel's life sciences community and its universities, the 15,000 physicians working in Israel's 25 hospitals, and thousands of researchers in the pharmaceutical and biomedical industries. Studies at the Center will lead to a wealth of information on human health and pathology, as well as advanced medical applications such as drugs, biomarkers, and diagnostic tools.

*Nancy and Stephen Grand*

The Center will promote Israeli efforts to personalize medical treatment. This means reaching the level of understanding needed not only to propose a general course of therapy but a treatment tailored for each individual based on his or her unique medical profile and specific disease variant. And with personalized medicine comes preventive medicine, the ability to identify beforehand – or early on – the threat of developing a disease.

Studies at the Nancy and Stephen Grand Israel National Center for Personalized Medicine cover a host of malignancies, including neuronal-related diseases such as Alzheimer's and Parkinson's and amyotrophic lateral sclerosis; developmental and behavioral deficits such as ADHD and autism; mental disorders such as schizophrenia; and cancer, diabetes and obesity; autoimmune conditions such as multiple sclerosis; infertility, and a spectrum of rare genetic disorders.

Heading the Center is Dr. Berta Strulovici, a Weizmann Institute alumna who was previously Vice President of Basic Research for Merck Worldwide; she brings to the Center valuable experience in team management and high throughput drug discovery.

The project is national in scope, with a steering committee comprising representatives from all major universities and hospitals in Israel with the biomed industry overseeing its operations. The chairman of the steering committee is Nobel Prize laureate Prof. Aaron Ciechanover, a faculty member of the Technion – Israel Institute of Technology.





# Grants to Weizmann Neurobiology Students

"Israel has the potential to become a world leader in neuroscience thanks to the creative spirit and out-of-the-box thinking that characterizes our small country," said Israel's President Shimon Peres at a ceremony in which he awarded grants to ten PhD students, including four from the Weizmann Institute. The grants are awarded for excellence and innovation to students from all over the country: NIS 200,000 over three years for each student.

The Institute's Prof. Yadin Dudai, who headed the grants committee, promised that big developments in brain research are just around the corner, and he said the grant winners will have a chance to take part in new, groundbreaking findings in the field.

The four students are Avital Hakhami, in the group of Prof. Rafi Malach, who compares brain scans of sick and well people to tease out differences in how information is passed along the brain's neuron networks; Boaz Mohar in the group of Prof. Ilan Lampl, who investigates how the sense of touch and feeling is processed in the brain; Rita Peretz, in the group of Dr. Rony Paz, who investigates the action of antidepressants on the brain; and Shiri Ron, in the group of Dr. Ofer Yizhar, who investigates areas of the brain associated with autism and schizophrenia, using the new method of optogenetics – activating neurons with light.

*(l-r) Rita Peretz, Boaz Mohar, Avital Hakhami and Shiri Ron*

*Prof. Daniel Zajfman, Minister Yaakov Perry, and Chair of the Israeli Friends Association Shimshon Harel*

In December, the Israeli Friends of the Weizmann Institute hosted a Science Club event featuring Yaakov Perry, Israel's Science, Technology and Space Minister, and Dr. Tali Kimchi, a young scientist in the Department of Neurobiology. Dr. Kimchi explores the role of pheromones – subtle scents that animals secrete to communicate – in masculine and feminine behaviors. Using a "big brother" type setup for mice, she showed that genetically engineered female mice that lack pheromone-sensing genes exhibit typical male sexual behaviors.

She showed several film clips taken in the lab of genetically engineered mice that lacked genes for pheromone sensing. The audience was surprised to see how characteristic gender-related behaviors change in these mice, as the females began to display typical male sexual behaviors, sniffing and chasing potential mates, even trying to mount them. Mr. Perry addressed the need to maintain Israel's scientific edge, saying that Israeli science continues to progress by leaps and bounds and is becoming an engine of economic, scientific, and social growth. "Israel is a wonderful country which could be even better if it could direct more of its resources to science, economy, and development."

# Cancer Cells' Addiction to a Healthy Gene

It takes two to tango – also in some cancers. Findings by Profs. Yoram Groner and Amos Tanay and their teams show that in certain leukemias, a mutated gene and its healthy counterpart engage in a sort of complex dance that keeps the cancer alive.

That gene, RUNX1, is crucial for the development and maintenance of the blood circulatory system, where it oversees the differentiation of adult stem cells in the bone marrow into the various mature blood cells. It takes only a single mutation in one of the pair of RUNX1 genes in this type of stem cell to send it down the path to becoming a leukemic stem cell.

When searching for information on a type of leukemia known as AML in genetic databases, the researchers noticed an anomaly: Rather than being silenced, as commonly happens in cancer, the second, healthy, copy of the RUNX1 gene in the leukemic cells appeared to be highly functional.

When the researchers grew leukemic cells in lab dishes and silenced the healthy RUNX1 gene in some of them, they found that only cells with the healthy version were able to maintain the cancerous growth. Further investigation showed that the healthy gene was essential for preventing the death of the cancer cells, and thus fostered the cancer's progression. In other words, the cancerous cells were addicted to the healthy gene.

In addition to pointing to treatments and new diagnostic methods for certain forms of leukemia, says Groner, further research is likely to turn up other instances of this sort of dance between pairs of genes. "It is something no one really looked for before," he says.

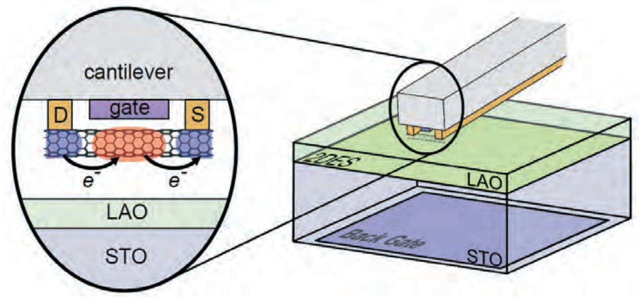
# Nanotubes See inside Material

How can you examine the filling of a sandwich if that filling disappears the moment you lift the top layer? Dr. Shahal Ilani and his group in the Faculty of Physics wanted to investigate the detailed microscopic properties of such a filling, which appears only when two insulating materials – known by the letters LAO and STO – are layered in a sandwich.

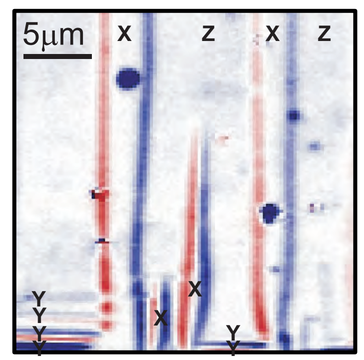
That filling, surprisingly enough, is a very thin conducting interface with some unusual properties. Separating the layers is clearly out; but conventional methods for probing electrons only work if the electrons are on a surface.

To circumvent this problem, Ilani and his team used an ultrapure carbon nanotube – fabricated using a technique previously invented in his lab. That nanotube was the basis of a highly accurate sensor that could hover right above the material and pick up the electric potential of electrons with unprecedented sensitivity.

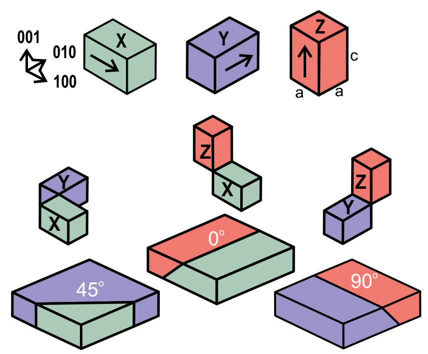
To the team's surprise, the electrons at the interface were ordered in a series of thin stripes. Shahal's explanation involves the crystal structure of the bottom, STO, layer. At the very cold temperatures at which the experiment was conducted, the crystals take on an oblong form. When voltage is applied, those oblong crystals array themselves in "combs" that guide the electric current. While the findings will have consequences for those now developing applications for these materials, Ilani and his team believe that the stripes – essentially one-dimensional wires – could give rise in the future to new types of electronics.




*A: The setup: An ultrapure carbon nanotube is positioned right above the material, enabling it to sense the electrons' locations inside the interface without disturbing them*




*B: The sensor revealed that the electrons beneath the surface create a curious pattern of stripes*




*C: When the material is cooled, the STO crystal building blocks change from cubes to oblongs that can be oriented upright or flat, explaining the striped patterns imaged by the nanotube sensor*

# 300,000-Year-Old Hearth is a Window on Prehistoric Culture

The use of fire – to cook our food, light up the night and drive away predators – is part of what makes us human. Although fire was discovered by our prehistoric ancestors around a million years ago, learning to control it for domestic use occurred much later.

Research in Weizmann Institute labs has recently helped confirm the earliest discovery of a hearth – a site of repeated fire use around 300,000 years ago.

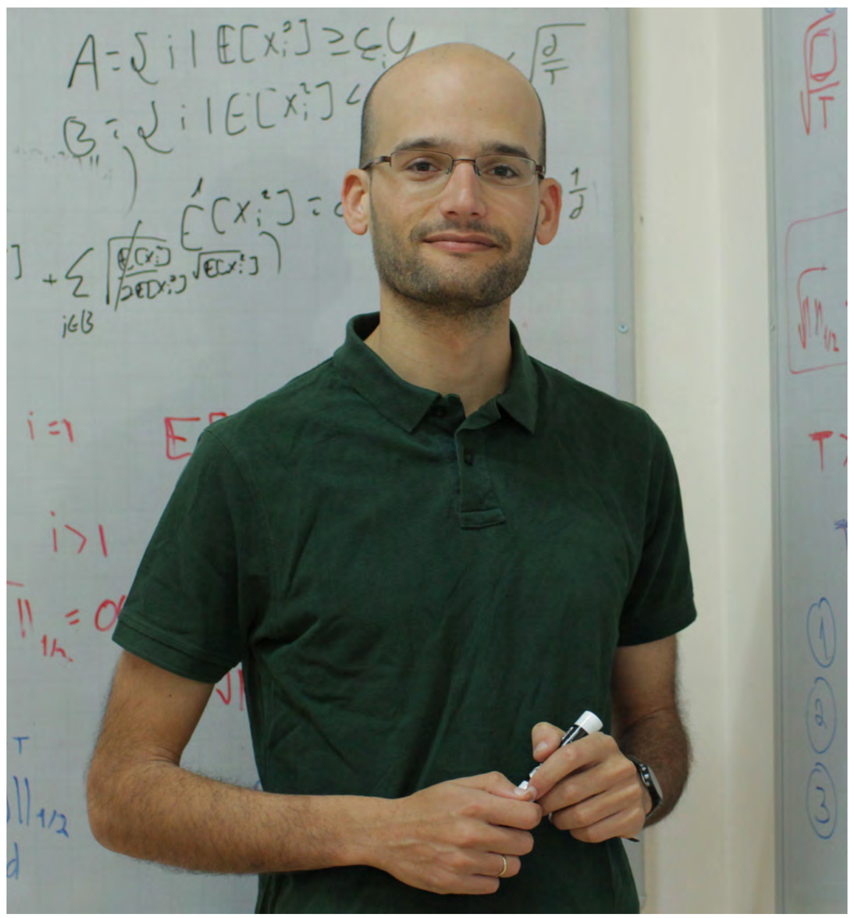
Dr. Ruth Shahak-Gross worked with a team headed by Tel Aviv University researchers who have been excavating Israel's Qesem Cave since 2000. Using the infrared spectroscopy equipment in the Weizmann Institute's Kimmel Center for Archaeological Science, she examined the remains of wood ash and burnt bone found in the center of the cave, determining that the site had been a large, hot hearth. To investigate further, Shahack-Gross removed a cubic block of sediment from the site and hardened it in the lab so it could be sliced thinly like a block of cheese. The slices were then observed under a microscope. The images showed fine micro-strata in the ash – a sign that fires were repeatedly lit in the same spot.

The concentration of ash layers near the cave's center, presence of larger remains of burnt animal bones, and the fact that the flint tools found in the cave were segregated – with meat-cutters near the hearth – all point to a social living arrangement in which different areas were marked for different activities. This finding, says Shahack-Gross, points to impressive levels of social and cognitive development; and it grants us a window on a period when human biology and culture were both undergoing rapid evolutionary change.

*Scan of a sediment "slice" from the hearth area of the cave showing burnt bone and rock fragments within the gray ash residue*

# Profiles: New Additions to the Weizmann Faculty

## Drs. Ohad Shamir, Ravid Straussman and Karen Michaeli are undertaking research that will be shaping our future



*Dr. Obad Shamir*

### Dr. Ohad Shamir

Today's average consumer can buy a camera that knows how to focus on faces, while sophisticated computer systems use voice recognition to identify speakers and transcribe the spoken word into text. These are all feats of machine learning. Learning algorithms bypass the information-overload problems of conventional programming by enabling computers and "smart" devices to accumulate knowledge in a somewhat human, intuitive way. Thus a computer can, through the repeated viewing of facial images or listening to a speaking voice over time, become familiar with the underlying patterns.

These learning algorithms aid computers in gaining skills that humans pick up as babies. But what about harder sorts of learning – subjects that adult humans struggle to absorb, for instance? Dr. Ohad Shamir, who joined the Weizmann Institute's Computer Science and Applied Mathematics Department in October, is taking this area of research to the next level: He is working out the details of machine learning in cases where added constraints make learning a complex endeavor. An example is the partial knowledge inherent in common medical practice: A doctor typically arrives at a diagnosis on the basis of a test result or two, reported symptoms, and his or her own experience. Practical considerations limit the number of tests a patient will undergo, as well as the number of resources a doctor will consult before forming an opinion. Assuming a computer has access to the same incomplete information, can it learn to diagnose disease as well as a knowledgeable doctor?

An even more complex subject is the human brain. One of Shamir's goals is to study computerized systems called artificial neural networks that can process information in ways that mimic our brain functions. These systems, says Shamir, are hierarchical, something like the layers of neurons in our brains that pass input from one to the next as they integrate and process our perceptions and thoughts. The artificial neural networks that have been created until now tend to rely on "tricks and hacks" – the tuning of many parameters – to be trained. Shamir hopes to develop software that can do the same thing automatically – just download and run. Ultimately, such systems could become the basis of advanced artificial intelligence.

Shamir's other areas of interest include researching solutions for machine learning in such large, decentralized, noisy networks as search engines. "Giant networks like Google, which are extremely large and disordered, tend to suffer from learning constraints," he says. "For example, algorithms that require access to a lot of data are problematic when that data is distributed among many computers around the world, and everything has to be communicated."

Dr. Ohad Shamir's arrival at the Weizmann Institute was a true homecoming: He is now in the same department as his father, Prof. Adi Shamir, a computer encryption pioneer and A.M. Turing Award recipient. Ohad grew up in Rehovot, attending the Institute's after-school classes and summer camps for science lovers. He received his BSc, MSc and PhD from the Hebrew University of Jerusalem, and it was there he began his investigations into machine learning.

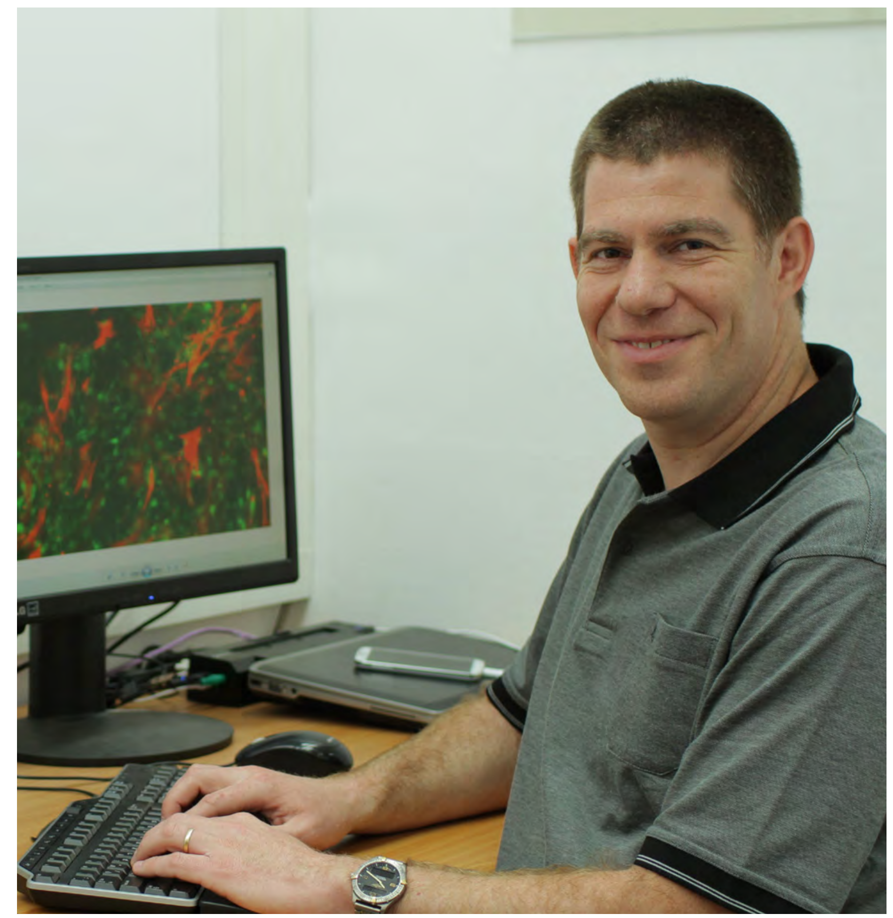
For his postdoctoral research, Shamir bypassed the usual university departments and went to Microsoft Research in Cambridge, Massachusetts. "Microsoft gave me a lot of freedom to pursue my interests; funding and resources were not a problem there. It also gave me the opportunity to interact with a number of people working on various practical applications within the company, and this even led to a couple of patents," he says. While living in Boston, Shamir met and married Michal, who is currently finishing her doctoral research in Indian studies at Harvard University. For Shamir, his wife's studies have presented an excuse to pursue his favorite pastime: traveling. He has trekked and climbed mountains all over the world. Though he is quite busy, at present, getting his research underway at the Institute, he hopes to find the time in the future to continue his treks.

### Dr. Ravid Straussman

"I had always seen myself as a clinician," says Dr. Ravid Straussman, an MD/PhD who recently joined the Weizmann Institute's Molecular Cell Biology Department. "But by the time I was nearing the end of my studies, I felt myself being pulled in the direction of research. Still, even when I'm conducting research in the lab, it is the human patents I have in mind."

The patients Straussman is thinking of are those who have little hope today, as their cancers are resistant to chemotherapy. Why do some tumors shrink at first, but refuse to disappear; while others vanish completely, only to return in a more resistant form later on? Why does a treatment that thoroughly destroys tumor cells in a lab dish turn out to be much less effective in the human body?

Straussman began investigating how cancers develop resistance



*Dr. Ravid Straussman*

in his postdoctoral research in the Broad Institute of Harvard and MIT in Massachusetts. In the research group of Prof. Todd Golub, Chief Scientific Officer of the Broad Institute and director of its cancer program, Straussman pursued this question from an unusual angle. While many researchers look for answers in the cancer cells themselves, comparing those that succumb to chemotherapy to the ones that survive, Straussman and the research team thought the key might lie elsewhere, in the healthily functioning cells of the body.

That is, he says, because cancer cells, like the other cells in the body, are part of a large, sophisticated, highly connected system with all sorts of efficient mechanisms for aid and assistance. Normal cells have the ability to call for help from distant parts of the body – the bone marrow for example – when they are wounded or under attack. The researchers thought that cancer cells might receive help in a similar way when besieged by chemotherapy drugs.

Straussman, Golub and the Broad Institute group began by growing a number of different types of cancer in the lab and testing their sensitivity to chemotherapy drugs. Indeed, they found that the lab-grown tumors, which contained only cancer cells, were highly sensitive to various chemotherapy drugs. But when the scientists added other, healthy cells of the sorts normally found in and near tumors, that sensitivity dropped – in some cases precipitously.

After realizing this phenomenon occurs in many types of cancer and with many drugs, the research team decided to zoom in on melanoma – which accounts for around 75% of skin cancer deaths. They identified a protein secreted by certain healthy cells in the tumors that can rescue the melanoma cells from one of the most advanced anti-melanoma chemotherapies available today. Called hepatocyte growth factor (HGF), this protein plays a role, among other things, in wound healing.

Next, they looked for signs of HGF activity in samples taken from melanoma patients. Their results showed that when cells in the tumor's microenvironment produced high levels of HGF the tumor was likely to be resistant to chemotherapy, while patients with cells that did not produce HGF had a much better response to treatment. This suggests that HGF, on its own, helps cancer cells survive. Based on these findings, clinical trials are now underway in which an HGF inhibitor is given to melanoma patients alongside standard chemotherapy.

"Tumors typically contain all sorts of cells – cancerous as well as healthy ones," says Straussman. "The range of healthy cells found in the tumor microenvironment may produce dozens of different substances that help the cancer resist chemotherapy. We are only at the very beginning of understanding what they are and how they aid and abet resistance."

Dr. Ravid Straussman was born in Ramat Gan, Israel, and served as an officer in the Israel Air Force. He completed his MD/PhD studies at the Hebrew University Hadassah Medical School, training in the lab of Prof. Shoshana Ravid. After a year of medical residency at Beilinson Hospital, he took up research as a postdoctoral fellow in the lab of Prof. Howard Cedar at the Hebrew University of Jerusalem. He then moved to the Broad Institute and joined Todd Golub's group as a postdoctoral research fellow. "Ravid, Cedar and Golub have been true mentors," he says. "I was very lucky to work with them."

Straussman is married to Sharon, a pediatric endocrinologist, and is the father of four children whose ages range from 11 to 2 – the youngest two born during his postdoctoral work in the US. In his spare time, he enjoys playing tennis.

## Dr. Karen Michaeli

"I didn't know I wanted to go into physics until I actually started studying it," says Dr. Karen Michaeli, who recently joined the Weizmann Institute's Faculty of Physics. That revelation took place during her undergraduate studies at Tel Aviv University, where she majored in physics and computer science. "There are probably easier ways to make a living, but none of them would be as much fun," she says.

Michaeli completed her PhD in the group of Prof. Alexander Finkel'stein at the Weizmann Institute. She was then awarded a Pappalardo Fellowship to pursue postdoctoral work at the Massachusetts Institute of Technology (MIT), which allowed her to conduct independent research with several of the leading physicists in her field. She also received an award from the Israel National Postdoctoral Program for Advancing Women in Science, given through the Weizmann Institute to help young women go abroad for postdoctoral studies.

A theoretical physicist, Michaeli focuses on understanding the rich variety of electronic properties of solids. While in most semiconductors and metals the individual electron is generally insensitive to the presence of other electrons, if the electrons do feel each other strongly the consequences are remarkable. Michaeli is interested in materials in which electric forces among electrons lead to very intricate collective behavior. This can turn the material into a magnet, a superconductor or an even more exotic, novel state of matter.

The route to revealing their properties lies in close collaboration between theory and experiment, and the possibility that fundamental insight can be tested in the lab and even utilized towards technological applications is particularly exciting to Michaeli. "In the future," she says, "understanding the variety of fascinating physical phenomena can advance the field towards one of the ultimate goals of material science – growing materials by design."

*Dr. Karen Michaeli*

She is very intrigued, for example, by a class of materials that holds promise for new types of electronics: oxide interface layers. Like semiconductors, these systems can be controlled extremely well in a lab, but they have an additional feature: The forces between the electrons in them are strong. A surprising result of this trait is the coexistence of both superconductivity and magnetism – properties that conventionally exclude one another. Recently, Michaeli was able to construct a model that solves this puzzle; but many other questions are still awaiting answers. "Our understanding of these materials, today, is where the understanding of semiconductors was in the 1970s," says Michaeli. "There is quite a bit of work to be done in this field." (For more on this type of system, see p. 4.)

Another topic that Michaeli researches concerns a powerful experimental tool used to analyze the interactions between electrons. Here, scientists look for the generation of an electric current after inducing a temperature difference between two edges of a material. "Observing the conversion of heat energy to electricity," Michaeli says, "can be a sort of magnifying glass enabling researchers to perceive the interactions between the electrons, and ultimately to reveal the physics underlying their behavior." This is because the forces between electrons can redistribute energy, even in a situation in which the electrons themselves cannot move.

In her earlier work, Michaeli developed a way to efficiently predict the results of such heat-to-electric-current conversion experiments in many systems. Her method can detect the tendency towards superconductivity, even when the forces are too weak to actually induce the superconducting phase and cannot be observed through any of the more standard measurements. In the future, she plans to further investigate the role of energy transport in different insulating systems, as well as to examine the possibility of extracting essential information on the properties of such systems from various types of measurements.

Though her research takes place in theoretical discussions in front of a blackboard or on a computer, Michaeli enjoys "talking shop" with experimental physicists: "Sometimes even a short discussion will give me a new angle to work on or a new question to answer; other times I can contribute a new perspective to an experimental setup."

# The 65th Annual General Meeting
## of the International Board

*Performance by the Israeli Opera accompanied by the Ra'anana Symphonette Orchestra*

The 65th Annual General Meeting of the International Board of the Weizmann Institute of Science, held November 3-6, brought together old and new friends of the Institute and offered a platform for the celebration of multiple visionary gifts to the Institute towards the advancement of scientific research.

The Opening Gala, on November 3, shone a spotlight on new scientists, including computer scientist Dr. Ohad Shamir and Dr. Ravid Straussman. The event also included a special performance of the Israeli Opera accompanied by the Ra'anana Symphonette Orchestra. The week included events dedicated to a spectrum of scientific disciplines, from personalized medicine to quantum electronics and from bioinformatics to space and planetary science – and the important relationship between science and philanthropy.

The Festive Open Session of the International Board included, as per tradition, the awarding of the 2013 Kimmel Award. This year's recipient was Prof. Amos Tanay of the Departments of Biological Regulation and of Computer Science and Mathematics. The award is a major vote of confidence in the research of Prof. Tanay, who is developing innovative computational biology methods for analyzing genomic data, which promises to have a major impact on the personalization of medicine. "This award gives me the freedom to explore my research and with it comes a sense of responsibility… not to enter a comfort zone but rather to explore new and exciting directions," said Prof. Tanay.

*Prof. Amos Tanay*

As well, Ted Teplow, together with his son David and grandson Nathan – representing three generations of the Teplow family – was honored for the family's gift towards the refurbishment of the Stone Administration Building. In a moving speech at the Open Session, the elder Teplow recalled his uncle, Dewey Stone – for whom the building is named – whose relationship with Dr. Chaim Weizmann in the 1940s led to Stone's deep and longtime friendship with the Institute. He was founder of the American Committee for the Weizmann Institute of Science and founding chairman of the International Board of the Weizmann Institute of Science. "It is our honor to continue the Stone and Teplow family legacy of friendship to the Weizmann Institute by giving this gift to upgrade the Stone Building," said Ted Teplow.

*Ted Teplow*

From the Rising Tide Foundation, the Weizmann Institute received a major gift to advance personalized medicine with an emphasis on cancer research. The Rising Tide Translational Research Fund will fund competitive grants for scientists embarking on research projects that are translational in nature; clinical collaborations with Israeli hospitals; start-up costs for new scientists whose work has a translational focus; and scholarships for medical doctors doing their PhDs at the Weizmann Institute through the PhD-for-MD Program.

The Foundation saw "a dynamic opportunity here in letting important research take its path," said Shawn Stephenson, Chairman of Rising Tide, at the celebratory lunch for the gift on November 5. It was the Institute's "ethos, culture, and incredibly strong scientific research," said Stephenson, that led the Foundation to make this gift.

Additionally, the Weizmann Institute dedicated the Gruber Center for Quantum Electronics on November 6. The Center was established through a gift by the Boutillier family from France as a way to memorialize family members who perished in the Holocaust. It will provide an organizational framework for intellectual exchange and collaboration, bringing together scientists from a range of fields within the realm of quantum electronics. Quantum electronics is one of the most promising emerging fields of nano-science; nanotechnology tools have developed to a point where scientists can engineer ever smaller and more complex semiconductor nanostructures, and can examine molecules and nanoparticles at unprecedented proximity. Prof. Moty Heiblum of the Department of Condensed Matter Physics is the first head of the Gruber Center.

*Shawn Stephenson, Chairman of the Rising Tide Foundation*

*Jacques Boutillier and Daniel Zajfman at the dedication ceremony for the Gruber Center for Quantum Electronics*

*Recipients of the PhD honoris causa with International Board officials*

# Seven recipients of honorary doctoral degrees

## In keynote speech, Prof. Helga Nowotny of the ERC calls Israel the "Ferrari" of scientific research

Members and friends of the Weizmann Institute gathered on campus on November 4 for the 42nd annual conferment ceremony of Doctor of Philosophy *honoris causa*. The degree is the Institute's highest honor, celebrating the achievements and exceptional contributions of outstanding individuals. The seven recipients this year have been endowed not only with remarkable talents and energies, but also with the generosity to share these gifts with the world, inspiring others well beyond their fields of activity.

Keynote speaker **Prof. Helga Nowotny**, a distinguished scholar of social studies of science and technology, was honored for her academic work and impressive achievements at the helm of the European Research Council (ERC). The ERC funds pioneering research, and the Weizmann Institute is a major beneficiary of ERC funding. Calling Israel the "Ferrari" of scientific research, Nowotny said that the ERC funding program is a "perfect match" with the Weizmann Institute of Science given the high quality of research conducted here.

Architect and entrepreneur extraordinaire **David Azrieli** was cited for his professional work and devotion to the State of Israel and its people, as evidenced by his longstanding commitment and contributions to manifold public endeavors. Speaking at the ceremony, Azrieli referred to what motivates his life's work: passion, curiosity, and creativity. The latter two, he said, are characteristic of the activity at the Weizmann Institute and explain his own affinity to the Institute, where, he says, "I have the feeling of something great happening."

**Maestro Daniel Barenboim** received the honorary degree for his legendary mastery of classical and contemporary music and championing of the transformative power of music, most notably through co-founding, in 1999, the West-Eastern Divan Orchestra, with the late Palestinian-American scholar Edward Said. The Orchestra brings together musically talented young Israelis, Palestinians, and other Arabs as well as Spaniards.

Barenboim "has flourished but always remained one of us... and I have always admired your use of music to build bridges," said Prof. Eytan Domany in his toast at the dinner following the conferment ceremony.

Two scientists were among the recipients, both of whom have longstanding partnerships with Institute scientists. **Prof. Harry B. Gray**, a frequent visiting scientist to the Institute, was honored for his pioneering contributions and ground-breaking research at the interface of chemistry and biology, which helped create new fields of research in inorganic chemistry. Gray said he had "fallen in love" with the Institute on his first visit to campus 34 years ago, and has been "in love ever since." He thanked members of the International Board for their support of "brilliant young people to join the fight in three critical problems the world is facing: energy, environment, and human health." Prof. Israel Pecht, who has known Prof. Gray for 50 years, said that he has "a unique talent for getting people fascinated with science."

**Prof. Bertrand Halperin** received his PhD *honoris causa* for his seminal research in a range of topics in condensed matter physics, which have generated key insights into understanding numerous physical phenomena. Prof. Adi Stern, who toasted Prof. Halperin, said that his years-long "scientific partnership and friendship is dear to us" at the Weizmann Institute.

**David Lopatie** from Johannesburg, a staunch supporter of scientific scholarship and education, was honored for his generosity in creating the David Lopatie Conference Centre and the David Lopatie Hall for Graduate Studies on campus. "David's generosity and commitment to science education is going to have an impact for years and years to come on generations of students – the scientists of the future," said Prof. Lia Adaddi, outgoing Dean of the Feinberg Graduate School.

**Luis E. Stillman** is a Hungarian-born Holocaust survivor who attained great success in a business career in Mexico, and has channeled the fruits of his professional accomplishments to various causes; for the Weizmann Institute he has been a dedicated supporter, loved by all, who has also helped the Institute reach out to new friends in Mexico. At the ceremony, Stillman depicted a handful of momentous scenes in his remarkable life.

## Dedication of the Raoul and Graziella de Picciotto Building for Scientific and Technical Support

A flash mob of Weizmann Institute employees swaying to Dolly Parton's song "Working Nine to Five" marked the start of the dedication of the Raoul and Graziella de Picciotto Building for

*Employees moving to the new de Picciotto Building celebrate its dedication*

Scientific and Technical Support, giving the dedication's participants a vivid sense of the large number of employees who will populate this building–some 481 people, or 20 percent of the Institute's personnel.

The building is a gift of Raoul and Graziella de Picciotto of Monaco. It offers an unprecedented level of efficiency in scientific and technical support services for the scientific research conducted at the Institute, such as human resources, procurement, construction, safety, operations, and more.

The new building is the Institute's biggest at 30,000 sq. m., and is located on the northern side of campus. "What we will achieve by this is a much more coherent way of working, and we will also release a lot of space on campus, which will in turn be transformed into much-needed laboratories and offices," said Weizmann Institute President Prof. Daniel Zajfman. "We need [multiple] units to work in an efficient and effective way, which requires providing the employees of the Institute with the best possible conditions. They will work in outstanding machine shops, warehouses, and office space, and with modern-age equipment, enabling them to work effectively, which will have a direct effect on the science."

In thanking the de Picciottos for their magnanimous gift, Prof. Zajfman said that Raoul "knows how to bring to the Institute not only support but also kindness, love, and a sense of familia. "I remember how kind you were – and you still are – to come to us and say, 'You tell me what you most need and I will help you achieve it, because I trust you'."

Raoul de Piccioto said it was a great pleasure to contribute towards the construction of a facility that provides all the engineering and technical support for the Institute's scientific activities. He noted that, "At this moment, my thoughts go to all my family, especially to my dearest cousin and friend, the late Maurice Dwek, who introduced me so many years ago to the Institute."

*Raoul de Picciotto at the dedication ceremony*

*Yossie Hollander speaking at the establishment of the Dana and Yossie Hollander Center for Structural Proteomics*


*Robert Drake, Chair of the European Committee, speaking at the Donor Wall ceremony, "Celebrating Giving"*

*Cathy Beck, Chair of Weizmann Canada, and Leon Koffler at the inauguration of the renovated Koffler Accellerator*

*Prof. Haim Garty and Prof. Daniel Zajfman with Dr. Shira Albeck, recipient of the Maxine Singer Prize for Outstanding Staff Scientist*

## Clore Prize goes to scientist studying the virulence of viruses

The ceremony for the Sir Charles Clore Prize for Outstanding Appointment as Senior Scientist at the Weizmann Institute of Science returned to its customary venue in the lobby of the Charles Clore International House this year, following several years of extensive renovations. The ceremony was held on November 4 during the Annual General Meeting of the International Board.

The prize went to Dr. Noam Stern-Ginossar, who joined the Institute's Department of Molecular Genetics this winter following a postdoctoral fellowship at the University of California at San Francisco.

The Clore Prize "is an extremely nice vote of confidence in my research, and I'm grateful to the Clore Foundation for this great honor," said Dr. Stern-Ginossar.

Dr. Stern-Ginossar was previously a recipient of a Clore Foundation fellowship under the auspices of the National Postdoctoral Award Program for Advancing Women in Science, which funds Israeli women scientists undertaking postdoctoral training overseas over a period of two years. She said that the award made a tremendous difference to her and her husband and two small children during their years in the U.S.

Dame Vivien Duffield of the UK, head of the Clore Israel Foundation, said she was "thrilled" that Stern-Ginossar was the prize recipient and sees her work as highly promising. She was also "delighted," she said, at the return to the Clore House, and described fond memories of spending extended vacations in the Clore family suite on the top floor of the building. Since its construction in 1964, the building has housed international students and visiting scientists.

*Dr. Noam Stern-Ginossar and Dame Vivien Duffield at the Clore Prize ceremony*

*Shira, Hana, and Gideon Hamburger with Prof. Yardena Samuels*

## Hamburger lab for Prof. Yardena Samuels

In the presence of close friends and family, and surrounded by members of the global Weizmann Institute family, Gideon and Hana Hamburger dedicated a new laboratory established by the M.E.H. Fund in the name of Margot and Ernst Hamburger, Gideon's parents. The new lab houses Prof. Yardena Samuels' young research team, which uses the power of DNA sequencing to identify new groups of genetic mutations involved in the deadliest form of skin cancer, melanoma.

Speaking at the dedication, Prof. Samuels said that she chose melanoma genetics as the focus of her studies because it is a very aggressive form of cancer, and, unfortunately, presently has no long-term therapy. One of her past discoveries, a mutation found in nearly one-fifth of melanoma cases, was particularly encouraging as it is located on a gene already targeted by a drug approved for certain types of breast cancer. Preliminary clinical trials are underway.

Prior to joining the Institute, Prof. Samuels excelled as an assistant professor at the National Institutes of Health in the U.S., following PhD studies and postdoctoral research at several leading cancer research institutes in England and the U.S. At the ceremony she said that during her 13 years abroad she had always wanted to return to Israel, and specifically to the Weizmann Institute.

The Hamburger family's support helped make this possible. For the past 27 years, Gideon Hamburger has been applying his considerable skills and experience in the service of the Weizmann Institute, including serving as Chair of the Israel Friends Association from 2000 to 2006. At the ceremony, he referred to the Weizmann Institute as "a second home," and said he is proud to be a Board member. Hamburger is president of the Harel Insurance Company and Finance Group and is active in public service that benefits children, students, culture, education and scientific research.

## It takes two (or more)

The partnership between scientists and the philanthropists who support their work – and how that partnership is a key driver of scientific research – was the subject of a lively scientific symposium held in the David Lopatie Conference Centre on November 6 during the International Board week.

"I wanted to give to medical research where you can get a return on your investment," said Harvey Knell, who with his wife, Ellen, established earlier this year the Knell Family Professorial Chair. In selecting Prof. Samuels as the chair's first incumbent, Mr. Knell said he identified with the field of genetics


*Prof. Yardena Samuels with Harvey and Dr. Ellen Knell*

because his wife is a medical geneticist and there is a history of cancer in their family. Prof. Samuels uses the power of DNA sequencing to identify new groups of genetic mutations involved in the deadliest form of skin cancer, melanoma.

He recalled his visit to the Weizmann Institute two years ago, and how amazed he was by what he saw. Prof. Samuels, who joined the Department of Molecular Cell Biology in 2012, spoke about how her experience as a teenager in the Dr. Bessie Lawrence International Summer Science Institute at the Weizmann Institute piqued her interest in science and launched her on her journey as a research scientist. The support of Gideon Hamburger and the Knells, in addition to the support she receives from the Henry Chanoch Krenter Institute for Biomedical Imaging and Genomics at the Weizmann Institute, has allowed Samuels to advance her scientific goals which hold major promise in elucidating the underpinnings of melanoma.

Siblings Sagit Shiran and Shay Teitelbaum said their intention in establishing an endowment fund for biomedical research collaborations with hospitals was to help nourish the connection between basic research and clinical applications. Dr. Rotem Sorek of the Department of Molecular Genetics, who received support from the Dr. Dvora and Haim Teitelbaum Endowment Fund, spoke about his research on "microbial warfare": the mechanisms by which microorganisms attack one another and defend themselves. He is hoping to harness the power of phages, or the viruses that kill bacteria, to go after only the bad bacteria and deliver a more targeted therapy for the treatment of disease.

Sagit and Shay are the children of Dr. Dvora Teitelbaum, a former scientist at the Weizmann Institute who together with Profs. Ruth Arnon and Michael Sela performed the pioneering scientific research that led to Copaxone®, a blockbuster drug for the treatment of multiple sclerosis.

Dr. Ido Amit from the Department of Immunology also participated in the session, as the first incumbent of the Alan and Laraine Fischer Career Development Chair, funded by Alan and Laraine Fischer of the U.S. Dr. Amit discussed his research in the field of single-cell genomics, in which he "catches" a single cell and extracts its genetic material with the hope of using it as a blueprint to provide a more precise disease therapy.


*Prof. Israel Bar-Joseph, Sagit Shiran, Shay Teitelbaum, Dr. Rotem Sorek, and Prof. Daniel Zajfman*


*The late Maurice and Vivienne Wohl*

## Closing Gala: Dedication of the Ilana and Pascal Mantoux Institute for Bioinformatics and the Maurice and Vivienne Wohl Institute for Drug Discovery

Two of the four pillars of the newly named Nancy and Stephen Grand Israel National Institute for Personalized Medicine were dedicated at the closing gala of the International Board week: the Ilana and Pascal Mantoux Institute for Bioinformatics and the Maurice and Vivienne Wohl Institute for Drug Discovery. The two entities will work closely in sync with the two other pillars of the Nancy and Stephen Grand Israel National Center for Personalized Medicine – the Crown Institute for Genomics and the de Botton Institute for Protein Profiling – which were dedicated in 2012.

The Ilana and Pascal Mantoux Institute was established through the generosity of Ilana and Pascal Mantoux of France and Israel. The Maurice and Vivienne Wohl Institute was established by a gift from the Maurice and Vivienne Wohl Charitable Foundation of the UK.

Pascal Mantoux noted that although he and Ilana have been involved with the Weizmann Institute for only a short while, they have quickly developed a strong sense of belonging to its family-like community. "Ilana and I feel deeply honored and equally humbled by the opportunity to enable the Ilana and Pascal Mantoux Institute for Bioinformatics to become a reality," he said.

The Nancy and Stephen Grand Israel National Center for Personalized Medicine (see related story, page 2) provides a wide range of scientific tools, services and information in the fields represented by its four institutes to Weizmann Institute scientists and scientists and physicians throughout Israel – in other research institutions, as well as hospitals – who need such biomedical information.

The decision by the Maurice and Vivienne Wohl Charitable Foundation to fund the Maurice and Vivienne Wohl Institute for Drug Discovery follows Maurice and Vivienne's commitment to the advancement of medical research with a particular emphasis on cancer, of which Vivienne herself was a victim at far too young an age, said Martin Paisner, CBE, a representative of the Foundation and an International Board member. Paisner said his hope is that "their memory be perpetuated through the continued achievements of the Institute's remarkable band of brilliant and talented scientists."


*Pascal and Ilana Mantoux*

# New Stem Cells for New Medicine

***Having a supply of stem cells that are identical to the embryonic ones, without the use of actual embryos, is the ultimate goal of this research.***

Dr. Jacob (Yaqub) Hanna was making news even before he got to the Weizmann Institute. The MIT *Technology Review* included him in its prestigious annual list, "35 under 35," in 2010; and in 2011, just before he arrived at the Weizmann Institute, Hanna was featured in *Discover* magazine, where he was described as "one of the youngest leaders in one of science's hottest fields."

Now appearing in *Cell* magazine's "40 under 40," Hanna is ambivalent about the publicity. While he is justly proud of his and his team's accomplishments, he is wary of the danger of substituting public relations for solid research and credible results. The important thing, he says is "relying on very deep and good science that could really change the field."

Indeed, in the short time he has been at the Institute, Hanna and his team have produced some exciting, potentially field-changing scientific results in his area of stem-cell research.

## Getting them to revert

Specifically, Hanna's research deals with getting adult cells to revert to their earliest forms – a reprogramming process in which the cells become "induced pluripotent stem cells (iPS cells)" that are very nearly the same as embryonic stem cells. Having a supply of stem cells that are identical to the embryonic ones, without the use of actual embryos, is the ultimate goal of this research; such cells would be invaluable for biomedical research and the treatment of many diseases. In the future, they could also fuel the field of organ growth for transplant. The scientist who succeeded in producing the first iPS cells in 2006, Shinya Yamanaka, received a Nobel Prize for his work in 2012.

The word "pluripotent" in the name is key: Just like the handful of cells in the very earliest embryo, induced pluripotent stem cells have the potential to turn into any type of cell in the body. Yet the process, still in its teething stages, is far from ready for clinical use. For one thing, conventional iPS cells, while mostly pluripotent, still bear faint signs of "priming" – changes in the nucleus that nudge the cell toward a development path. Though the very creation of iPS cells was a stunning tour de force, the process has remained cumbersome: It can take up to four weeks; the timing is not coordinated among the cells; and less than one percent of the treated cells actually end up becoming stem cells.

Hanna has, in his short time at the Weizmann Institute, systematically shown the way to overcome these obstacles. While other groups have made some progress by tinkering with the original formula, Hanna has gone back to basics, looking at embryonic stem cells and asking what factors can keep them in a stem state, as well as probing cells that undergo reprogramming to understand the underlying mechanics of the process.

## Detective work

In its original form, cell reprogramming involves inserting just four genes into adult cells, but Hanna was convinced that there was another factor lurking in the background: a brake that normally keeps differentiated cells from sliding backward into a stem cell state. Already in his postdoctoral work in the group of Prof. Rudolph Jaenisch at the Whitehead

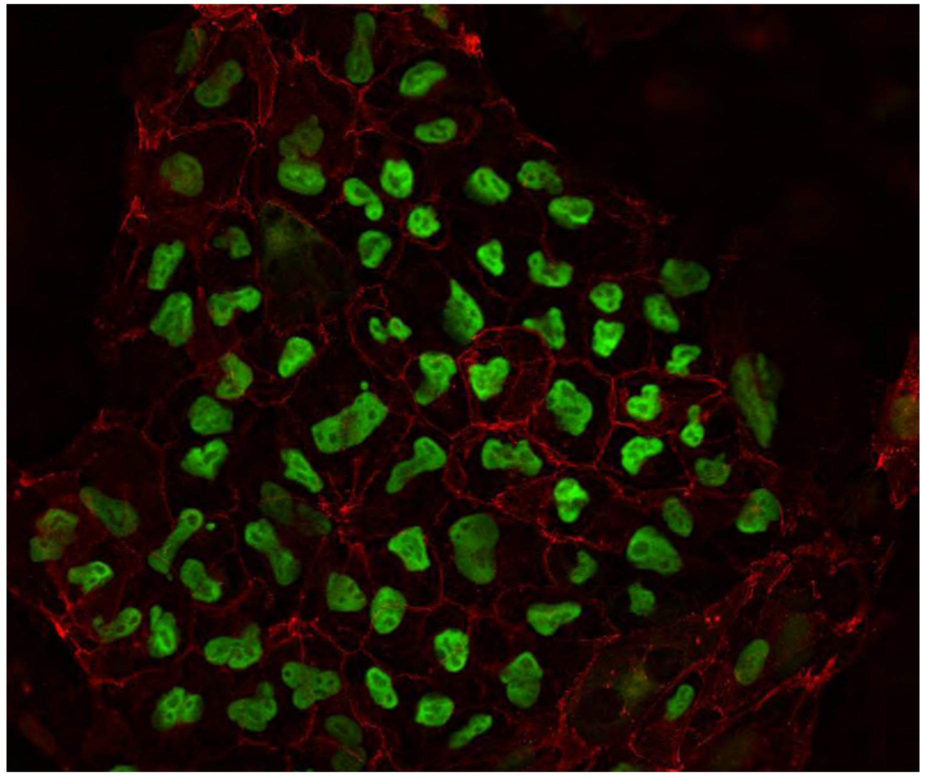
*Dr. Jacob Hanna (left) with Ilana and Pascal Mantoux*

## Scientists and supporters

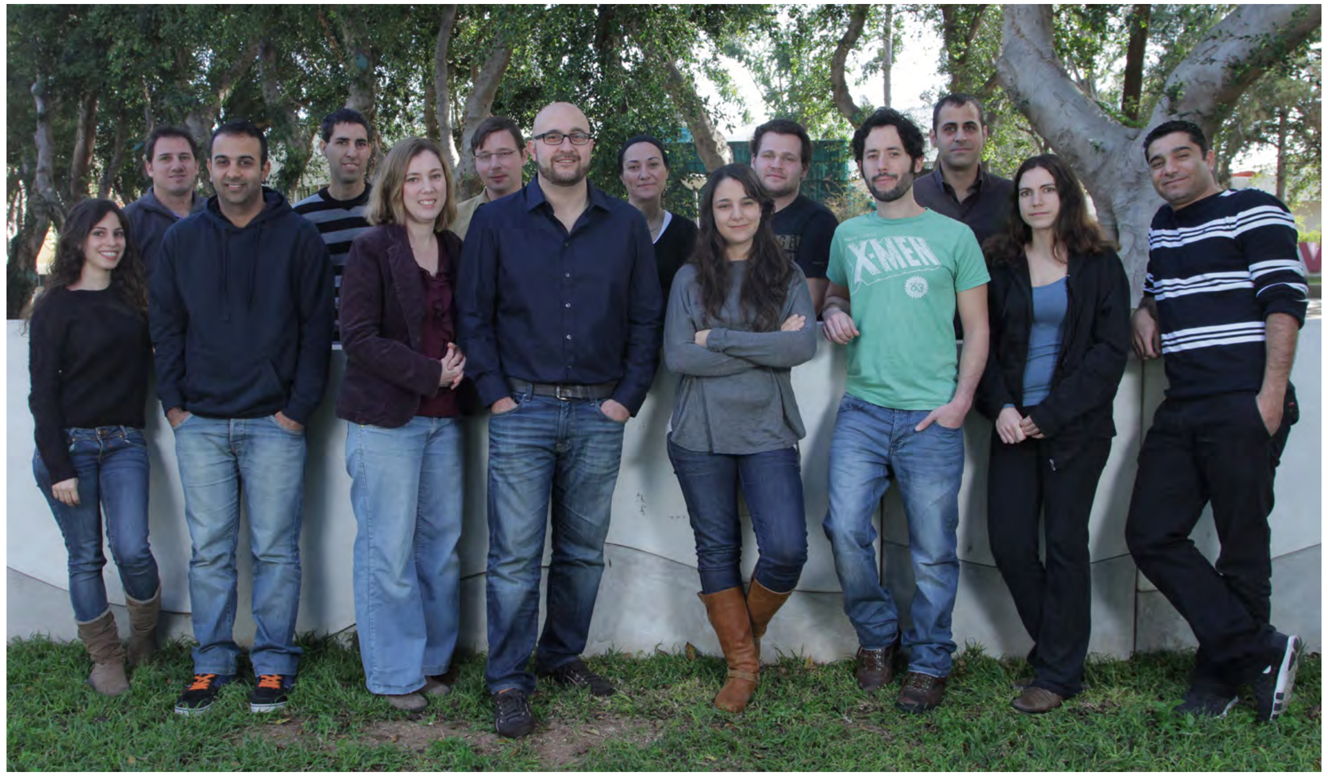
Ilana and Pascal Mantoux decided to undertake the support of Dr. Jacob Hanna's lab before they ever met him. But their donation soon led to a close relationship. "Ilana and Pascal are very warm people," says Hanna. "They are almost like parents to all of my lab members. In our competitive corner of science, it feels good to know that there is someone cheering us on." The Mantouxs' donation, says Hanna, has been a "super engine." It arrived at a critical time and is enabling him to put together a large, complex biology lab, get a jump-start on his research, and attract top students and postdocs to his group.

Says Ilana Mantoux, "When we decided to support another biomedical project at the Weizmann Institute, Pascal and I were introduced to several topics, each of them impressive and attractive, but the one that appealed most to us was stem cells, an innovative and promising field. After we reviewed the biography of the young investigator pursuing this line of work, Dr. Jacob (Yaqub) Hanna, it was clear to us that he is one-of-a-kind. And indeed, when we met him, we saw that he is a brilliant man, enthusiastic in an infectious way, diligent, indefatigable and determined to realize his goals. In particular, we saw a young scientist who never compromises on the quality of his work, which is highly regarded worldwide and which is published in the most prestigious professional journals.

"His professional achievements are very impressive, but Yaqub's personality is even more captivating. Yaqub is a modest person. He is also a generous person and makes a point of expressing gratitude to us personally and toward the Institute on every occasion. With endless patience, he shares with us the content of his studies and news of every achievement and publication. Yaqub gives us the feeling that we are truly a part of his life. His sensitivity, sense of humor, and gentleness – which take nothing away from his decisiveness on matters close to his heart – fill our own hearts and make us feel fortunate to be associated with his projects."



*Naive human stem cell colony stained with E-cadherin (red) and Oct4 (green)*



*Dr. Jacob Hanna (center) with his research group*

Institute for Biomedical Research at the Massachusetts Institute of Technology, Hanna had proposed the existence of such a brake.

This past year, he and his group found that brake, a protein called MBD3. Identifying the protein, whose function was previously unknown, took a bit of classic detective work. MBD3 first caught their attention because it is active in every cell in the body, all the time. This is highly irregular: The body's cells are uniquely specialized, and their proteins are generally specialized for specific functions as well. Next the researchers set up a tail, following the protein back in time to see if there were any instances in which MBD3 was not active. Those instances turned out to be the first three days after conception. These are exactly the three days in which the nascent embryo is a growing ball of pluripotent stem cells that will supply all the cell types in the body. MBD3 proteins make their first appearance on the fourth day, when differentiation begins and the cells already start to lose their pluripotent status.

**Hanna was convinced that there was another factor lurking in the background: a brake that normally keeps differentiated cells from sliding backward into a stem cell state.**

The real "aha" moment came when the researchers blocked this protein in cells undergoing reprogramming in the lab: They managed to increase the success rate from under 1% to 100%. In addition, they reduced the time needed to complete the process from four weeks to eight days, with all the cells undergoing reprogramming at the same rate – an advance that will aid researchers.

## Beyond four genes

Last year also saw another obstacle to iPS usage topple in Hanna's lab – that of the priming. The team developed a combination treatment, on top of the four-gene method, that would take their cells all the way back to the earliest "naive" embryonic stem cell state and, just as importantly, keep them from differentiating right away. To test their cells, the lab group marked them with a fluorescent gene and inserted them into very early-stage mouse embryos, letting them develop for around ten days. In these "humanized" mouse embryos, human tissue developed alongside the mouse tissue, proving the new cells were viable. Hanna believes that the technique, based on naive iPS cell production, could one day provide the basis for growing human organs in the lab.

## Doctors in the family

Dr. Jacob Hanna was born and raised in Rama, an Arab village in the Galilee; he grew up in a family of doctors: His grandfather, father and three sisters are all doctors. Hanna also went to study medicine, at the Hebrew University of Jerusalem; along with his MD he ended up with a PhD, completing his MD/PhD program *magna cum laude*. In this, he also had inspiration from a family member: His uncle, Dr. Nabil Hanna, an immunologist, was the chief scientific officer of Idec Pharmaceuticals, and he was behind the development of the first monoclonal antibody approved for therapy for humans. The antibody, anti-CD20, was introduced in 1998 for treating lymphoma. Jacob describes himself as a loving nephew who was greatly inspired by his uncle's journey.

**The technique, based on naive iPS cell production, could one day provide the basis for growing human organs in the lab.**

In his postdoctoral research at MIT, Hanna created iPS cells from mouse models of sickle cell anemia. He then corrected the gene for the disease and injected the mice's own cells back into them, curing the disease while avoiding any complications from the rejection of foreign cells.

Hanna joined the Weizmann Institute in 2011. When asked by *Discover* why he was returning to Israel Hanna answered: "Academia is perhaps the only environment in Israel where people interact without differences, and Weizmann is a great interdisciplinary institute."

Hanna is, at this point, busy day and night with his lab work, but he hopes, in the future, to find time to work on an issue that is close to his heart: education in the Arab sector. "We need to identify the top students," he says, "and figure out how to give them all the advantages and encouragement they need." Among other things, he would like to be able to provide the same type of role model he, himself, had in his uncle to young Arab students.

# Maurice Dwek

## At home in the world, and at Weizmann

If its spirit of entrepreneurship and innovation were what drew Maurice Dwek to the Weizmann Institute of Science, that attraction may be explained by the fact that his own life was so deeply marked by those same characteristics. Dwek, an involved leader and major supporter of the Institute who died last July in London, led a finance career marked by out-of-the-box ways of working that reshaped the banking sector in Switzerland. His work on behalf of the Institute was consistently marked by fresh ideas and initiatives that have strengthened the Institute in multiple ways.

With his passing at age 81, the Weizmann Institute lost a close friend. He was a longtime member of the International and Executive Boards and Chairman of its European Committee, in which capacity he strengthened the Institute's network in Europe and recruited numerous new supporters. Among them were his brother Solo (with whom he consistently partnered in their philanthropy to the Weizmann Institute) and their cousin, Raoul de Picciotto, who recently gave a major gift to support the construction of the largest building on campus, for scientific support services. Dwek helped establish W-GEM, the Institute's endowment, and PAMOT, a venture capital fund for early-stage start-up companies based on Institute discoveries. Maurice received an honorary PhD from the Institute in 2001 and Solo received one in 2009.

"Maurice would take phone calls related to Institute affairs from underwater if it were possible. He certainly always took them late at night and on his dinghy while on holiday – I know because I spent many holidays with him," remarked Peter Stormonth Darling, a business colleague and close personal friend.

Dwek left behind his wife Janet, and two sons, Julian and Edward.

In their philanthropy, Maurice (also known as Maurizio) and Janet always partnered with Solo and his wife Jeanette, and established, among other things, the Dwek Campus Center and the Solo Dwek and Maurizio Dwek Research School of Chemical Science. "Maurice did so much for us for so many years – the time devoted, the money contributed, the energy expended, and the love and care exhibited – and always so generously with an open mind and heart," says Weizmann Institute President Prof. Daniel Zajfman.

*Maurice Dwek; Solo Dwek in background, at the dedication ceremony of the Dwek School of Chemical Science*

"Maurice had an instinctive feel for the financial markets, and was one of the more outstanding bankers of his generation who shook up the banking industry in Switzerland," said Darling, speaking at Dwek's memorial service in London in November. "He had a well-developed sense of humor and was mischievous. He was a natural leader, a kind and intellectual individual, and always well-informed. He had a restless mind. He was optimistic, and an excellent judge of character. He had a tremendous gift for putting people at ease and was a gentleman with a warm heart and irresistible charm. He performed acts of kindness to others and at the same time was modest and self-deprecating; he never sought credit, and was intensely loyal to his friends and those who worked for him."

### A life of invention and reinvention

Maurice's father, Murad, was one of seven siblings who all played a role in operating their father's thriving textile business in Aleppo, Syria, in the early 1900s. When sea trade routes opened up, enabling faster and more effective shipping than land routes, Murad, a brother, and a sister relocated to Beirut. Four other brothers moved to port cities in the Middle East and Asia in an old-world version of corporate globalization. Murad married Adele de Picciotto; Solo was born in 1929 and Maurice in 1932.

During his childhood, Maurice and his family often traveled at Passover to Palestine – crossing the border by car, stopping off to visit relatives in Haifa, and continuing a long and winding route through Nazareth to Jerusalem. In Jerusalem, they visited their paternal uncle, a doctor at Hadassah Hospital. "We were attached to Palestine ever since we were young because of these visits," says Solo. When their mother fell ill, she traveled to her brother-in-law at Hadassah, and died in Jerusalem, at age 44. She is buried on the Mount of Olives.

In Beirut, Maurice lived a life common to Jews of the Middle East in that era: closely tied to the Jewish community – attending an Alliance Israélite school

*Maurice Dwek*

*Janet and Maurice Dwek*

*Prof. Haim Harari  and Maurice Dwek*

*Raoul and Graziella de Picciotto with Maurice*

– yet surrounded by Muslim and Christian friends and colleagues. After Alliance, Maurice attended a Christian school; their father's two partners in his textile plant were Muslims. But co-existence came to an abrupt end in 1947 leading up to the establishment of the State of Israel, when riots broke out in Beirut. After an uncle was kidnapped for ransom and returned, Maurice's father and uncle left for Europe, and Maurice and Solo followed shortly after, in early 1948. The plant was left intact, with the expectation that they would return. But huge strikes in the factory ensued because of its Jewish ownership. The Dweks never returned and the plant went out of business.

At age 14, Maurice closed one chapter of his childhood and started another. He and Solo attended a boarding school in Lausanne, and Maurice then joined his father in Paris, and continued with his studies. Solo later moved to Japan, but the brothers kept in touch. "No matter where we were, we were constantly in touch throughout our lives," says Solo.

Maurice got a job with Ufitec Bank in Zurich – previously Banque Zilkha, a bank whose roots went back to Beirut and Baghdad; Ufitec sent him to Montreal and New York to work and train in banking. Later, back in Zurich, Maurice met Gilbert de Botton who was also working at Ufitec. De Botton went on to become a world-famous banker and was a Weizmann Institute supporter and active Board member. He introduced Maurice to the Institute, in the late 1980s, and to then-President Prof. Haim Harari.

In 1972, Maurice left the bank and opened Soditic SA, a Geneva-based bank. Maurice "had fresh, new ideas for the Swiss market," says Solo. "He became well known for imagining a new way of financing companies and he became highly successful."

Over the next two decades, Soditic revolutionized the banking landscape in Switzerland, then the beating heart of the banking world. An article in the Financial Times after Dwek's death credited him with having "toppled the cartel of domestic banks that had held sway over Swiss franc corporate bond issuance until well into the 1980s." The "big three" as they were known – Credit Suisse, Swiss Bank Corp., and Union Bank of Switzerland – had controlled the lending market, but Dwek's company offered innovative financial products that eventually drew big clients.

Soditic came to the attention of banking giant S.G. Warburg & Co., which acquired the company, becoming S.G. Warburg Suisse S.A. Later, in 1996, Dwek re-launched Soditic in London through partnerships with Citigroup and Mercury Asset Management, and repurchased the stakes of its previous minority shareholders. After his forced teenage relocation to Europe, notes Solo, Maurice re-invented himself all over again.

## Family and philanthropy

Above all, however, was his family. Maurice married Janet in 1973 and they had two boys, Julian – who is a member of the International Board – in 1974 and Edward in 1977. "The boys saw his example and they followed it," says Janet, adding that they became banking interns in New York as early as age 16. "And his energy was enormous. I couldn't keep up with his pace. He'd spend four days in the office and then he'd have to go somewhere."

Maurice made a point of involving his sons in his philanthropic interests in Israel, and brought them to Israel many times, and to the Weizmann campus. Beyond Weizmann, he and Solo generously support the Dana-Dwek Children's Hospital at Tel Aviv Sourasky Medical Center (Ichilov), established by their paternal aunt.

"Maurice Dwek, of blessed memory, and his brother, Solo Dwek, adopted the Dana-Dwek Children's Hospital in memory of their beloved aunt and uncle, Rene and Subhi Dana," says Prof. Gabi Barabash, CEO of Tel Aviv Sourasky Medical Center. "After Rene's passing, Maurice and Solo generously helped renovate and expand the hospital. Maurice was a wonderful, warm person and a true friend; we are grateful for the Dwek family's commitment to the children treated at Dana-Dwek Children's Hospital."

"He encouraged me to attend the ISSI (the Dr. Bessie Lawrence International Summer Science Institute) in the early 1990s and I did," says Julian, who resides in London, as does Edward. "It was one of the best summers of my life… My father relished his connection to Israel and the Institute, and he was in noticeably better spirits when he was at the Institute, 'in the trenches' dealing with Institute matters, or having just returned from a trip to the campus."

Maurice was the driving spirit and founder of PAMOT, the Institute's venture capital fund, which was launched in 1997. In coordination with YEDA, the Institute's tech transfer arm, PAMOT creates start-up companies based on insights and technologies that have emerged from the Weizmann Institute, and nurtures them until the companies are able to attract major outside funding. Dwek understood the challenge of this particular stage of translating discoveries into real benefit for society.

At the same time, he understood the important separation between business and philanthropy, in which the latter places trust in the scientists and plays no part in the outcomes, notes Prof. Harari.

As President in the 1990s, Prof. Harari approached Maurice about funding the Dwek Campus Center. The story goes that Maurice agreed to fund half as long as Solo agreed to half – and when approached, Solo agreed to half as long as his brother agreed as well. "We never made a major move without the other," Solo recalls.

The Dwek family also established a fund to advance groundbreaking biomedical research, with a special focus on the fertility research of Prof. Nava Dekel of the Department of Biological Regulation. Throughout the years, the family, Solo and Jeanette in particular, developed a close relationship with Dekel. "Because of their support, my research and my work on a new fertility treatment protocol, which is now implemented around the world, was able to go full speed ahead, and for that I am forever grateful," says Prof. Dekel.

Prof. Milko van der Boom, acting director of the Solo Dwek and Maurizio Dwek Research School of Chemical Science – one of the five research schools under the auspices of the Feinberg Graduate School – says the support of the Dwek family has "had a profound impact on graduate education in chemistry at the Weizmann Institute. It has enabled funding for a wide range of student needs and activities and altogether enriches the graduate education of chemistry students, thus building Israel's future in this dynamic and important field that has so many implications for health and technology. We are grateful for his generosity and proud to be associated with his legacy."

In the final years of his life, Maurice expressed a wish to be buried in Israel, to be close to his mother's final resting place. He is buried in the Kiryat Shaul Cemetery in Tel Aviv.

"Maurice was at home all over the world," said Harari to dozens of friends and family who gathered to celebrate his life at the West London Synagogue. "For hundreds of years, the phenomenon was known as the 'wandering Jew.' Today it is called 'globalization'. Maurice was Mr. Globalization. He spoke multiple languages and was a mix of multiple cultures – like a well-coordinated orchestra in one person. Maurice was also a great philanthropist who was particularly devoted to Israel. The Weizmann Institute caught his eye and captured his heart because it exists in Israel and is run by Israelis, and he understood that science has no nationality and contributes to the well-being of people everywhere."

# Testing the Waters

## A marine research center opens at the Weizmann Institute

The Mediterranean region is well known for its warm, sandy beaches, long history and the diverse cultures lining its shores. But what of the sea, itself? Until now, researchers have mostly neglected this body of water. The Weizmann Institute's Prof. Aldo Shemesh intends to help change that. The Mediterranean, mostly surrounded by land and dense human settlement, is a sort of natural laboratory for understanding how human activity affects the aquatic environment. Climate change, pollution and runoff, rising atmospheric carbon dioxide, large-scale fishing, shipping or the recent spate of gas and oil drilling: Unlike the oceans, which can absorb a fair amount of insult, the Mediterranean reacts rapidly to these things. More research is needed, says Shemesh,

***The Mediterranean, mostly surrounded by land and dense human settlement, is a sort of natural laboratory for understanding how human activity affects the aquatic environment.***

both to learn how to preserve unique Mediterranean ecosystems that today have little protection and to help us understand how large-scale marine cycles may be affected by environmental change.

The dearth of broad data on the eastern side of the Mediterranean should soon begin to change. Rising to a call from a number of academic bodies in Israel, Weizmann Institute scientists, with the support of Miel de Botton, have established the de Botton Center for Marine Science. It is an ambitious undertaking: Today's marine science requires a dedicated commitment of both time and resources, including participation in research expeditions and obtaining specialized equipment. A high-throughput mass spectrometer (ICP-MS) for analyzing water samples has already been installed at the Weizmann Institute. Plans for additional equipment include two underwater gliders – small "drone" submarines that will navigate the local Mediterranean waters at different depths for long periods.

*Prof. Aldo Shemesh*

These gliders, which will beam data back to the lab via satellite, can be remotely programmed so that chemists, ecologists, geologists and biologists will all be able to use them.

The Center will work in collaboration with the Interuniversity Institute for Marine Sciences, Eilat, as well as various European marine research groups.

### Uncovering Microscopic Secrets

"To assess the impact of today's human activities or predict what will happen in the future, one first has to understand the changes the sea has undergone in the past 100, or 1,000 or more years," says Shemesh, who is the first director of the Center. Shemesh analyzes the microscopic remains of living creatures buried under the sea floor – diatoms and ancient corals – to find traces of this past. He takes core samples from various locations – most recently from off the coast of Sicily – and checks the ratios of oxygen and carbon isotopes in the bits of hard material these organisms have left behind. His findings are helping to fill in the blanks of life, water and climate in the long-ago sea.

Another scientist in the Center, Dr. Assaf Vardi, also investigates microscopic marine life: in this case living diatoms and their relatives – phytoplankton. The health of phytoplankton populations is crucial: Not only are they the basis of the entire ocean food chain, but they are responsible for around 50% of the oxygen we breathe. Yet researchers are only now beginning to unlock the secrets of these microorganisms: why they sometimes form gigantic blooms that suddenly die out; why they produce toxins that can move up the food chain; how these simple, single-celled organisms manage to exchange sophisticated information; what survival strategies they have adopted in their evolutionary arms race against viruses; and more. Ultimately, Vardi aims to understand phytoplankton on every scale – from individual signaling molecules to the planet-wide effects of large populations. Phytoplankton influences even extend to the climate. Vardi has teamed up with Prof. Ilan Koren, one of two climate scientists to conduct research through the center, to explore how floating algal cells may be swept up into the atmosphere, where they assist in cloud formation.

Shemesh: "The de Botton Center for Marine Science will enable us to conduct research in the Mediterranean over the long term, which is vital to understanding processes that play out over decades or millennia. The multidisciplinary nature of the Weizmann Institute is also crucial – we can apply physics, geochemistry, biology and Earth sciences to uncovering the large picture."

## Where it's all happening: the new de Botton Center for Marine Science

Changes in the Mediterranean Sea are occurring at an unprecedented pace, posing fundamental and urgent questions regarding its climate, oceanography, biology, and atmospheric variations. A new research center at the Weizmann Institute, established by Miel de Botton, will provide an interdisciplinary team of scientists the opportunity to undertake a thorough study of the oceans and, particularly, the Mediterranean, and foster collaborations with colleagues from other research institutions in Israel and abroad.

The new de Botton Center for Marine Science, headed by Prof. Aldo Shemesh of the Department of Earth and Planetary Sciences, will introduce – for the first time in Israel – autonomous, underwater robotic gliders capable of collecting large amounts of information with high spatial and temporal resolution. The deployment of two such gliders to continuously cruise the eastern Mediterranean Sea will provide researchers with high-quality maps of seawater, wildlife, and sediment characteristics. It will also enable the creation of an underwater observation system – the first of its kind in the Mediterranean, and one of only a few worldwide.

Daughter of the late Gilbert de Botton, who was an influential member of the Weizmann Institute's International Board, Ms. de Botton continues to uphold her family's tradition of enabling the Institute to pursue research on new frontiers. In 2012, the Institute inaugurated the de Botton Institute for Protein Profiling, an advanced and sophisticated platform for studying proteins in a holistic manner, under the auspices of the Nancy and Stephen Grand Israel National Center for Personalized Medicine.

# Prof. Hadassa Degani and Andrea Klepetar-Fallek

## The establishment of a professorial chair and the start of a lifelong friendship

It took just a few minutes for Andrea Klepetar-Fallek and Prof. Hadassa Degani – the first incumbent of the professorial chair donated by Klepetar-Fallek – to realize their match was the beginning of a long and close friendship.

In 1997, Andrea approached the Weizmann Institute, interested in making a gift that would make a difference in cancer research. At the time, Degani was about to publish her seminal research on an MRI-based method to detect breast and prostate cancers, which, after FDA approval, became the accepted technique for detection of these cancers worldwide. Andrea established the Fred and Andrea Fallek Professorial Chair in Breast Cancer Research, and the women set a date to meet for dinner in New York, where Fallek resides.

"It took us only moments to realize that we clicked, both in terms of her interest in my science and on a personal level," recalls Degani about that meeting. Since then, the duo has kept in touch on a near-weekly basis and they see each other frequently in New York and Israel. Degani updates Klepetar-Fallek, who is 93, on her research, and then the conversation turns to "music, art, friends, travel, politics, life," says Degani. "Andrea is a person who is constantly living, who is intelligent and interested in the world, and she is perhaps the most optimistic person I have met."

"I am very happy that I connected to Hadassa and that I have been associated with her work," says Klepetar-Fallek. Her discoveries, she says, "excited me" and were practical. "Hadassa has also been very active in promoting women in science, which is wonderful, and I'm delighted about the increase in the number of young female scientists who have been recruited to the Institute." It always impressed her, she adds, that Degani raised three children while pursuing a demanding career in academic research.

For her part, Degani says her friend's life story of perseverance and optimism in the face of challenge and difficulty has always inspired her. "She is a citizen of the world," says Degani, and she was also "extremely supportive of my work and encouraged me so much over the years."

Andrea Klepetar-Fallek was born in Austria in 1920 and moved to Yugoslavia on the eve of World War II. She survived an Italian concentration camp; her first husband was killed while fighting the Germans under the command of Josip Broz Tito, the Yugoslav communist leader who headed the Partisans resistance movement during the war. She moved to Israel in 1948, where she stayed for nine months before moving to Argentina. She married anew, and her husband, Juan Klepetar, managed the laboratories of the Swiss-based healthcare company Hoffman-La Roche in Argentina, Uruguay, and Chile. He died in 1970, and shortly thereafter she moved to Switzerland. She met Fred Fallek in Israel's Ben Gurion Airport in 1975; the two got married and moved to New York. Fred died of cancer in 1983.

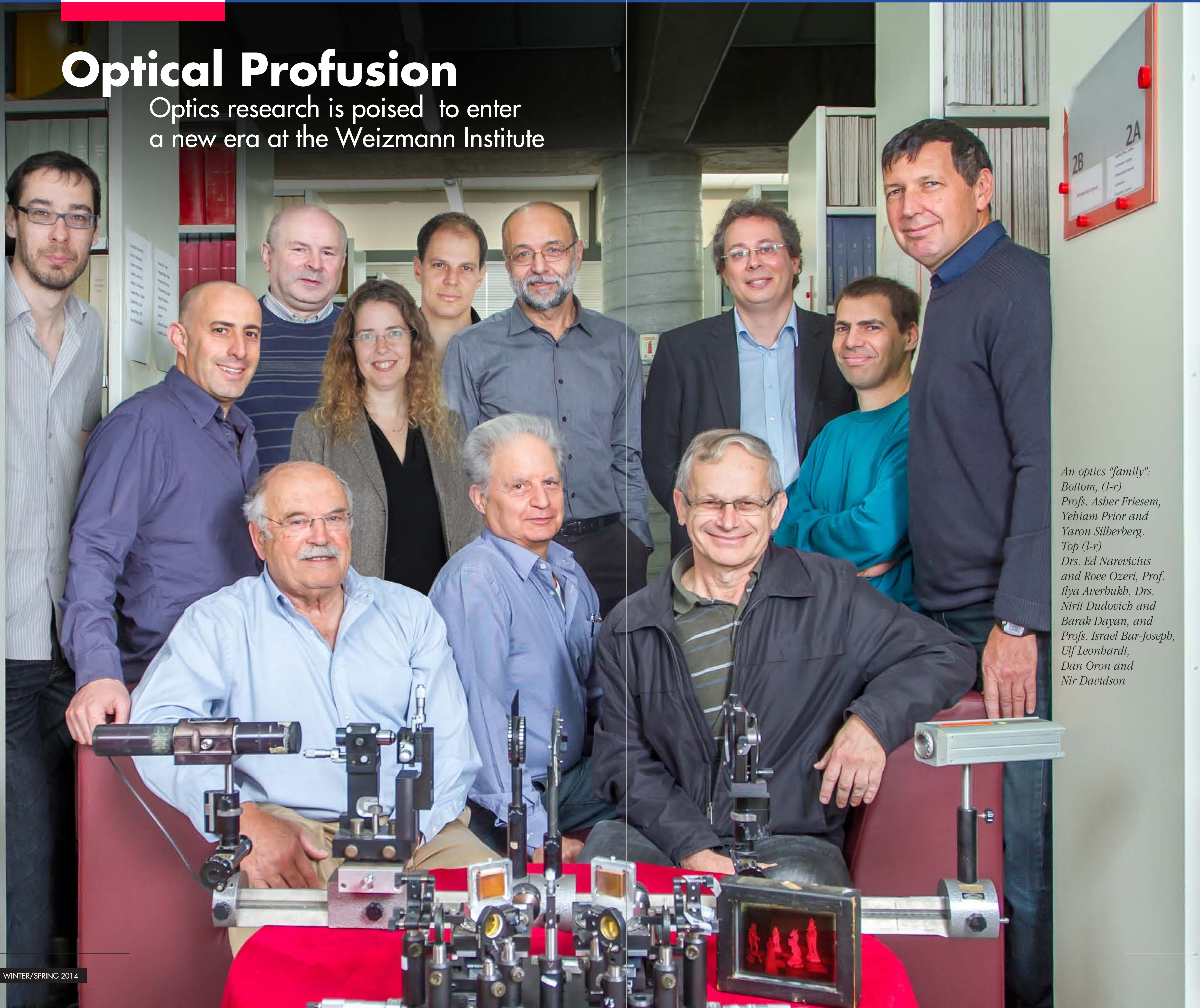
Klepetar-Fallek is a Board member of the Weizmann Institute and has given generously to other areas at the Institute including the National Postdoctoral Award Program for Advancing Women in Science. Her first gift was in 1974, for a student scholarship. She travels to Israel once a year, and maintains deep friendships here.

"Our friendship would not have started without science," says Degani. "But it is not because of science that it has continued."

*Prof. Hadassa Degani and Andrea Klepetar-Fallek*

# Optical Profusion

## Optics research is poised to enter a new era at the Weizmann Institute



*An optics "family": Bottom, (l-r) Profs. Asher Friesem, Yehiam Prior and Yaron Silberberg. Top (l-r) Drs. Ed Narevicius and Roee Ozeri, Prof. Ilya Averbukh, Drs. Nirit Dudovich and Barak Dayan, and Profs. Israel Bar-Joseph, Ulf Leonhardt, Dan Oron and Nir Davidson*

Over 300 years ago, Sir Isaac Newton performed what could be called the first modern optics experiment: He split a beam of white light into colored rays with a prism and then reunited the colors back into white light with a second prism. Not only did Newton prove that the white light we see is actually composed of different colors, he showed that light itself is a physical entity that can be manipulated. Today, our ability to control light has been taken to some fantastic extremes: lasers that can "see" around corners or under the skin, or that pulse in such tiny fractions of a second they can catch electrons in mid-leap, experiments that manipulate single photons, plans for bending light to create "invisibility cloaks" and more.

The André Deloro Institute for Space and Optics Research, recently dedicated at the Weizmann Institute, is now providing a framework for a wide range of optics research at the Institute. This research crosses faculty lines – about half is in Physics, the other half in Chemistry. It brings together theoreticians who are working on new ideas for future testing, experimentalists probing the basic nature of the physics of light, and yet others who use light and its properties to push the envelope on pragmatic laser and microscopy techniques, as well as developing nanomaterials for converting sunlight to energy. The following are just a few of the recent advances attained by Weizmann Institute scientists in this field.

### Fast, focused and flexible

When a laser beam hits a solid, opaque surface, for instance skin, it will either scatter or slice its way through. But what if a laser could focus underneath the skin, say on a tumor inside the body? For many years, Prof. Yaron Silberberg has conducted pioneering work on lasers that flash in pulses of less than a millionth of a millionth of a second. Such pulses of highly focused light can cut cleanly through tissue without harming neighboring areas. He and his group developed an algorithm that can predict how the beam will scatter when penetrating a material and adjust for the

## Four decades of optics research

When Prof. Asher Friesem joined the Weizmann Institute's Faculty of Physics in 1973, he was one of only a handful of Israeli scientists in the field of advanced modern optics. At the time, this research included holography – the information storage method that uses lasers to create three-dimensional imagery – optical fibers and laser technology. "I was lucky to get into the field at the beginning," he says. "Back then, people were still wondering what lasers would be good for."

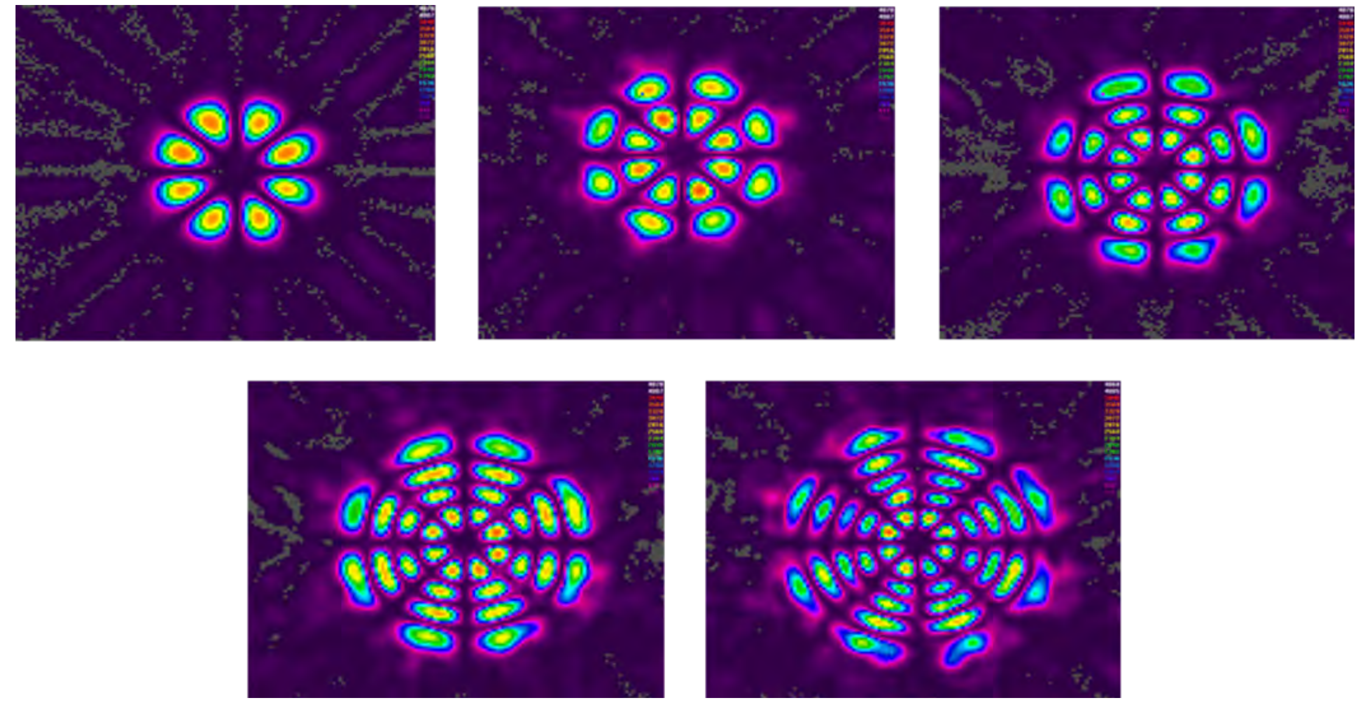
In Friesem's 40 years at the Weizmann Institute, his research has continued to be ahead of its time. For example, a press release from the 1970s heralds his invention of new optical recording materials that "will make it possible to store the information contained in 1000 books on a recoding plate the size of a postcard." In the 1980s Friesem and his group developed innovative techniques for transferring images through optical fibers. In addition, they investigated nonlinear effects in optical fibers that limit data transmission, suggesting methods for overcoming these limitations. In the 1990s Friesem and his group pioneered the creation of holographic optical elements and wearable holographic displays that can be embedded in eyeglasses or in pilots' helmets as a light-weight, flexible alternative to cumbersome display projection. Yet another early invention of his group was a method for using holography, rather than X rays or ultrasound, to detect potentially dangerous defects in metal parts or in the composites used in such things as airplane wings.

Since 2000 Friesem and his group have continued to make seminal contributions to laser technology. For example, they have developed gating waveguide structures (GWS) that use electronics, rather than the slower mechanics, to efficiently tune the wavelength of a laser beam. Recently, Friesem and Prof. Nir Davidson developed new techniques for combining many lasers to achieve power previously unattainable with a single laser.

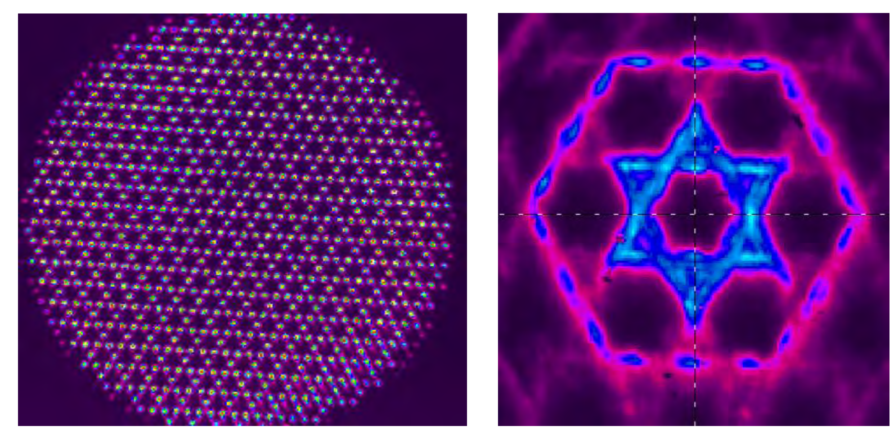
"If the leading technology of the last century was electronics, we are now in the 'photonics' age," says Friesem. "The Weizmann Institute is at the forefront of this movement."

During his career, Friesem has amassed over 30 patents, and a number of Israeli start-up companies have been established based on these patents. Many of his students have gone on to create optics-based research in Israel's universities and industries, with applications in fields ranging from defense to biomedical instrumentation.

Friesem takes particular pride in the growth of optics research at the Weizmann Institute: Profs. Yaron Silberberg, Nir Davidson and Israel Bar-Joseph are his former students. They and their students, Prof. Dan Oron, Drs. Nirit Dudovich, Roee Ozeri and Barak Dayan ("my scientific grandchildren"), are now following in his footsteps, conducting groundbreaking optics-based research in the Institute's Faculties of Physics and Chemistry.



*The output light distribution of lasers selected to operate at a single high-order mode. The regular arrays of bright spots indicate high control over the output beam profile obtained by properly designed phase elements, which are inserted inside the laser cavity. Beams with larger numbers of bright spots correspond to higher-mode numbers and yield more power, while maintaining the good beam quality required for most laser applications in industry, medicine and science*



*Left: An array of more than 1000 coupled lasers located on a Kagome lattice (named after its similarity to the Kagome [star shaped] pattern, found in many of the oldest Shinto shrines). Right: The light pattern emitted by the entire array (observed at long distance) reveals the phase relation between the individual lasers. The "Star of David" pattern observed for the Kagome lattice indicates a lack of long-range phase ordering resulting from the existence of an astronomical number of "good" solutions and the inability of the system to choose between them. This phenomenon, known as "geometrical frustration," is believed to play a major role in certain quantum magnets. All images from Profs. Asher Friesem and Nir Davidson* dispersal, so that the beam will focus precisely at a given spot, and in exactly the right time frame.

In much the same way that Newton found he could revert colored bands to white light, Silberberg and his group have discovered the trick for refocusing light that has scattered off a surface – not just lasers, but any light. Using an LCD screen similar to those used for computer projectors and a computer algorithm they developed, they created a system called a spatial light modulator that "unscrambles" the incoming light waves. This system turned paper – which normally bounces light off its surface in all directions – into a reflecting mirror; and it enabled the team to "see" around a corner, with a camera. This finding, too, may have future biomedical applications, particularly in imaging technologies.

Dr. Nirit Dudovich managed to measure an incredibly tiny time frame using ultra-fast laser pulses. It takes only a few attoseconds – a billionth of a billionth of a second – for an electron to pop out of its home and fly back into place. This is a quantum phenomenon known as tunneling. Dudovich induced tunneling in some electrons with one laser, and then, with a second laser, gave those electrons a "kick" that sent them off course. Electrons that return home emit a photon as they slide into place; but the ones that were kicked could not get back to their starting point, and thus did not emit a photon. In another experiment, Dudovich used a similar technique to time differences in the exit speeds of electrons of different energy levels, recording a time of just 50 attoseconds – possibly one of the shortest intervals ever recorded.

## Light shifts

Prof. Yehiam Prior, a chemist, collaborates with both experimental and theoretical groups. In one recent project, conducted together with Dr. Adi Salomon, a Weizmann alumna who is now on the faculty of Bar Ilan University, the researchers created a new type of surface for manipulating light. Using a very thin sheet of silver, the team drilled tiny, regular "nanocavities" – around 100 nanometers across – into the surface. These nanocavities are shorter than the wavelength of visible light, and the team found they could achieve all sorts of interesting effects – for example, the generation of new colors of light – by adjusting the wavelength and cavity shape. When they created cavities patterned with minuscule corrugations, these resonated with matching wavelengths to boost the generated light intensity. The high spatial and wavelength resolution suggests that such materials might have a number of uses, among them data storage, high resolution sensing, optical switches and photochemistry.

In another study, Prior and Prof. Ilya Averbukh used lasers to set molecules spinning and then measure their spin. In previous research, Prior, Averbukh and their research teams had suggested that one could use ultra-fast laser pulses to get the molecules in a gas all spinning in the same direction. They found that collisions between the fast-rotating molecules could lead to the creation of a large gas vortex similar to a weather cyclone. In the present study, they got molecules in a gas spinning with two laser pulses – the first to line them up and the second to set them rotating. To observe the molecules' spin, the team employed a phenomenon called the rotational Doppler effect, which relies on the wave nature of light. When a corkscrew-shaped light wave hits an oblong rotating object – even one the size of a molecule – the scattered wave is either shortened (light shifts toward the blue end of the spectrum), or lengthened (made redder) depending on the sense of rotation. By observing the change in the light color, the team managed to detect the sense of the molecular spinning.

## Visible frustration

Sometimes, when the components of a system have too many choices – for example the molecules of water in ice – the result is frustration. One can envision a system of atomic spins in which every up spin forces the atom next to it into a down spin. Now try to predict the spins of atoms in a triangular arrangement. Prof. Nir Davidson, working with Prof. Asher Friesem, created a visible model of frustration using over 1000 lasers, all packed together in one optical resonator. Meddling with the beams in various ways – covering the mirrors within the laser cavity with mesh-like masks or repositioning the output mirror – enabled various lasers to leak light to one another, producing changing, "frustrated" patterns of light.

## Changing colors

Prof. Dan Oron investigates what happens when light interacts with materials, especially nanoparticles. When particles get down to a size that is smaller than the wavelength of light, interesting things begin to happen. In recent research, Oron and his team created crystalline nanorods that could solve one of the major issues impeding progress in solar collector technology: the fact that standard collectors absorb light in only a limited range of wavelengths. These rods – 2000 times smaller than the width of a human hair – can absorb a pair of red photons, which are at the low end of the energy scale, and emit a higher-energy green photon at the other end. The nanorods can be tuned to almost any color simply by adjusting their radius, making them potentially useful for a number of optical applications. Oron is now working to increase the efficiency of the nanorods to the point where it will be practical to insert them alongside more conventional materials into solar cells.

## Photon control

Unlike electricity, which today can be precisely managed down to the level of individual electrons, no one has yet learned how to deterministically control the actions of photons. Devices that could potentially change that state of affairs – operating on light instead of electricity – are being built today in Dr. Barak Dayan's labs.

At the heart of Dayan's setup is a unique, ultra-tiny chip-based device, fabricated at the Institute, which enables the trapping of single photons together with a single atom. This single atom, controlled by lasers and magnetic fields, interacts deterministically with single photons. Several years ago Dayan demonstrated this device for the first time, showing it could indeed manipulate the flow of single photons.

Today, he and his team are conducting the first experiments in photon control, based on their previous theoretical studies. One part of the experiment, for example, involves the creation of a single photon "switch," able to direct photons to different ports according to a "command" given by another photon. This photonic equivalent of an electronic transistor could pave the way toward quantum computers that will operate on single atoms and single photons.

Such a device could also perform as a "quantum eavesdropping" system that could count the number of photons in a pulse of light used for optical communication and "snatch" a single photon only if the number of photons enables it to remain undetected.

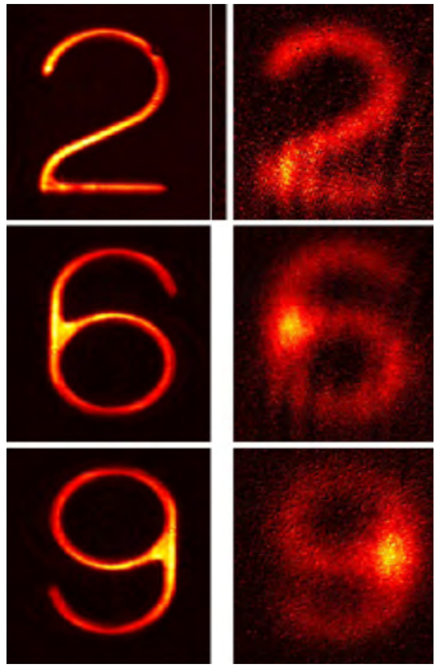
Dayan: "Once we can create such devices with photons, we'll be able to transform today's communication and computation systems into tomorrow's powerful quantum technologies."

## The light fantastic

While laser scientists are generally engaged in creating ever straighter beams of light, Prof. Ulf Leonhardt is more interested in how light curves in space. Curved light is all around us – it is why a fish in an aquarium appears to be displaced from its actual position or a setting sun appears above the horizon. Leonhardt has suggested a way of guiding light in a region of space – using basic physical principles and the properties of new optical materials – so that an object within the region will be invisible. Several experimental teams around the world have recently had partial success in creating "invisibility cloaks" based on his ideas.

By the same token, says Leonhardt, the precise guiding of curved light could be used to sharply refocus blurred images. Such a technique could overcome what has been considered a basic limit of optical microscopy – the wavelength of light. In addition to raising the roof on the resolution of light microscopes, if the method works with visible light (so far it has been demonstrated with the longer wavelengths of microwaves), it could be used to achieve highly detailed etching on electronic chips.

In further research, Leonhardt has demonstrated that light can be used in the lab to study the darkest objects in the Universe – black holes. Short, intense pulses of laser light in an optic fiber can mimic the radiation that is thought to be emitted by black holes.



*Images of nanometer-sized digits (left) that have been stored for several microseconds in a hot atomic vapor. The spread-out images (right) result from the diffusive motion of the atoms that store the information. [Nir Davidson, Moshe Shuker, Ofer Firstenberg, Rami Pugatch and Amiram Ron]*

# A transformative new gift for exploring the limits of physics, outer space


*André Deloro*

A visionary gift from André Deloro and his Adelis Foundation of France has established two major entities on campus that together promise to advance physics research in Israel, with worldwide impact. The establishment of the André Deloro Institute for Space and Optics Research and the André Deloro Research School of Physical Science were celebrated at the International Board in a dedication event and a dinner at the David Citadel Hotel in Jerusalem on November 5.

Deloro, who died in 2012, gave generously throughout his life to a large number of causes in Israel, but remained anonymous in his giving, doing so through his foundation. (Adelis is an acronym for André Deloro Israel). Adelis previously made a major gift for joint brain research between the Weizmann Institute and the Technion, and to metabolic syndrome research at the Institute. The foundation also provided start-up funds for the lab of Dr. Oren Schuldiner of the Department of Molecular Cell Biology.

"André provided us the tools to follow our dreams. He believed that the best way to provide for the security and future of Israel was through science and education," Prof. Daniel Zajfman said at the dinner.

André Deloro was born in Cairo in 1933 and immigrated to France in 1950. He studied at the École Polytechnique and the École Nationale des Ponts et Chaussées (ParisTech) and become a world-class engineer. His first major project was the design and construction of an international port for export of liquefied natural gas in Algeria. The project that won him international recognition in his profession was creating a mega-hotel and business complex on the shifting sands of Saudi Arabia using engineering techniques that he developed.

"My brother had an amazing intellectual capacity which he used, to fund major projects linked to Israel and his Jewish identity," said his brother, Albert Deloro.

Prof. Zajfman described André as a builder who put great trust in people to help carry out his vision, and enabled cooperation between others. This was especially apparent, the President noted, when he found himself sharing a plane to Paris to see Mr. Deloro in 2012 along with the presidents of two Israeli universities: Prof. Peretz Lavie of the Technion, and Prof. Rivka Carmi of Ben-Gurion University. The three presidents presented André with the Weizmann Award in Science and the Humanities in May of that year, several months before his passing.

Prof. Zajfman recalls that Deloro had asked him for the Institute's help in fulfilling his dreams for Israel in education, science, and security. "André told me that the Weizmann Institute has the tools to help Israel in all three of these areas: He said, 'I want you to do this for me.'"

*The new André Deloro Institute for Space and Optics Research*

Plans for the André Deloro Institute for Space and Optics Research and the André Deloro Research School of Physical Science were finalized after Deloro's death.

The Deloro Institute, said Prof. Oded Aharonson of the Department of Earth and Planetary Science, will enable the blossoming of the space and optics field in Israel. The Deloro Institute will combine 20 interdisciplinary groups dedicated to the study of light and the inner realm of matter and to exploring the universe in new ways, including participating in the planned Israeli ULTRASAT satellite, which will look outwards into space from Earth's orbit to explore the ultraviolet spectrum and search for information on the supernova explosions that reveal secrets of the early universe and of how stars are born and die.

The André Deloro Research School of Physical Science is the final pillar of the five research schools built as a framework to provide a competitive edge for students at the Feinberg Graduate School at the Weizmann Institute. It creates a generous endowment that provides consistent support for graduate students in the physical sciences. This includes grants to students for personal research, books, computers, travel; and greater exposure to world leaders in their fields.

At the dinner celebrating Deloro's legacy, Rebecca Boukhris, director of the Adelis Foundation, gave a sense of his remarkable vision and showed a film prepared by the Foundation that revealed his lifelong dedication to Israel.

# Show of Hands:

## Who benefits from an advanced education for school teachers?


*Graduation ceremony for the Rothschild-Weizmann program*

The capped-and-gowned group beaming on the stage of the Ebner Auditorium on December 26 was no ordinary graduating class. They included 31 outstanding science teachers from throughout Israel – Arabs and Jews, secular and religious, from bustling cities and more distant regions – all united by a passion for teaching and for their subject – be it mathematics, physics, chemistry, biology, technology, or related fields. This was the fourth group to receive masters' degrees from the unique Rothschild-Weizmann Program for Excellence in Science Teaching at the Weizmann Institute.

When teachers' knowledge is nourished, both they and their students are enriched – that's the concept behind the Rothschild-Weizmann Program, established in 2008, which offers MSc degrees to active schoolteachers. From its outset, the program set an ambitious goal: to significantly improve the quality of science education in Israel by creating an elite corps of well-educated and highly motivated science teachers. In order to fulfill their mission and adequately prepare their students to cope with today's and tomorrow's world and the myriad opportunities it offers, science teachers must keep up with the increasing complexity and sophistication of today's science and technology. The Rothschild-Weizmann Program, funded by the Rothschild Caesarea Foundation, offers participants 50 courses specially developed in collaboration with Weizmann Institute scientists, providing junior- and high-school teachers with a rich and up-to-date science and science teaching curricula. In addition to coursework and lectures, the teachers participate in research in the Institute's labs and are challenged to develop new teaching tools in their final projects.

Administered through the Feinberg Graduate School, the program is headed by Prof. Shimon Levit of the Faculty of Physics and Prof. Bat Sheva Eylon, Head of the Department of Science Teaching. Participants are active teachers, splitting their time between their own school classrooms, carrying out their teaching duties, and their coursework on the Weizmann Institute campus, as students. The program also offers post-MSc development and implementation of field initiatives, and last year an alumni outreach track was added, which aims to keep in contact with the graduates and to create opportunities for continued engagement. As the community of graduates grows, this track is expected to expand to include more activities.

Speaking at the recent graduation ceremony on behalf of the teachers, graduate Naama Pesia Tal said, "The ability to bridge the gaps within Israeli society depends first of all on education. Today, we are better teachers than we were when we began our studies in the Program, and we are all linked by the mission to educate the children of this country – and not leave a single student behind."

Vice President for Resource Development and Public Affairs, and Dean of Educational Activities Prof. Israel Bar-Joseph encouraged the new graduates to stay in touch: "As far as we are concerned, your graduation does not mark the end of your association with the Weizmann Institute. You are a part of the Institute, and we will do all we can to help you in your future endeavors."

## HEMDA Rehovot, a new regional science school, gets under way

*Dr. Ronen Mir illustrates scientific principles to Hemda students*

HEMDA Rehovot opened this fall with an overwhelming response: 13 classes of tenth graders, totaling 300 students. A regional science learning center offering advanced science curricula and sophisticated labs to high school students, HEMDA Rehovot is affiliated with and operated by the Weizmann Institute of Science and is currently housed at the Davidson Institute of Science Education. Plans for construction of a state-of-the-art building adjacent to the Davidson Institute are under way, which will allow the addition of students from all high school grades.

At HEMDA, students seeking to take their matriculation exams at the highest levels in physics and chemistry receive their instruction in those subjects rather than at their own schools. It serves the surrounding communities of Rehovot and Nes Ziona.

HEMDA Rehovot is modeled on HEMDA Tel Aviv, the Center for Science Education in Tel Aviv-Jaffa, founded in 1991. That center has proved to be a great success, offering instruction in physics and chemistry to outstanding students in most of the high schools in the area; it forged a new model of science education in the whole area. Weizmann Institute President Prof. Daniel Zajfman is chairman of HEMDA Tel Aviv.

That first facility represented an experiment in regional science education; the idea was that if it worked, it would be the first of many similar regional science education centers across Israel. The experiment did indeed bear fruit, as is shown in the steady achievements of students in matriculation exams and in their military service.

Dr. Ronen Mir, director of HEMDA Rehovot, was previously director of MadaTech, the Israel National Museum of Science, Technology and Space in Haifa, and was the scientific director of the Clore Garden of Science; he is also an Institute alumnus. What's special about HEMDA, he says, is its "high-level labs, which are a costly resource to maintain and thus too expensive for most schools. The equipment, the lab staff, the manpower – all of these demand a lot of resources. The teachers will invest significant time in keeping updated about science and in ongoing professional development. In addition, its innovative programming involves training students in the development of new technologies and exposing them to the 'real world' of research and industry."

# New Space Telescopes

## will build on Israeli experience

Smaller, lighter, faster to build, easier to launch and one-tenth the cost of today's big space telescopes: That is the idea behind a unique collaboration between Weizmann Institute scientists and researchers in California, Israeli and American industry, and NASA. The proposed project, says Institute astrophysicist Prof. Eli Waxman, could lead to a new era of research based on a number of small, special-purpose telescopes that will expand the boundaries of astrophysical research. Among other things, they might enable us to understand how black holes grow, or solve such mysteries as the sources of high-energy cosmic radiation.

The project, called ULTRASAT (Ultraviolet Transient Astronomy Satellite), will take advantage of Israel's unique technological experience in building small satellites, as well as the growing scientific collaboration between astrophysicists at the California Institute of Technology (Caltech) and the Weizmann Institute. Today, several Weizmann Institute researchers are involved in the project along with Waxman: Profs. Avishay Gal-Yam and Oded Aharonson, and Drs. Eran Ofek and Ilan Sagiv. This group is supported by Jeremy Topaz and Ofer Lapid, engineers with extensive satellite experience. Other participants include Caltech's Prof. Shri Kulkarni, as well as a team from Caltech, NASA's Ames Research Center and Jet Propulsion Laboratory, and researchers from Tel Aviv University.

ULTRASAT, which will observe light in the ultraviolet range, will be based on a new concept: It will observe a relatively large arc of sky at low resolution in order to detect transient events – for instance, the flare-up of a distant star. Once such an event is identified, the satellite communications system will alert other, high-resolution telescopes around the world in real time, and these will capture the details of the event.

One thing the ULTRASAT telescopes will be looking for is supernovae – the death throes of exploding stars. To understand the processes that lead to supernova explosions, scientists need to catch these stars in the act – just as the blow-up begins. Until now, finding such early-stage supernovae has been mostly a matter of luck, but with ULTRASAT looking out for them, says Waxman, hundreds might be identified, some within minutes of the onset of an explosion.

***Another possible finding is gravitational waves – ripples in space-time that are predicted by the Theory of Relativity but have never been observed***

Another phenomenon that the researchers want to observe in real time is so-called tidal disruption events – the extreme pull on stars that are being torn apart by black holes. ULTRASAT is expected to identify around one hundred such events a year, so that scientists will be able to measure the phenomenon and understand how it contributes to the physics of black holes and the space around them.

In addition to building a solid understanding from the observation of these phenomena, the researchers are hopeful that other, more elusive, events might come to light under ULTRASAT's watchful eye. For example, we might finally be able to identify the mysterious source of ultra-high-energy neutrinos. These rain down on Earth from cosmic sources, but they are extremely hard to detect. If the rare measurement of such neutrinos could be tied to an observed event in space, we might have evidence pointing to their source.

Another possible finding is gravitational waves – ripples in space-time that are predicted by the Theory of Relativity but have never been observed. Researchers think that gravitational waves might be detectable between two very close, large masses, i.e., two medium-sized black holes in the process of merging. A wide-range observer like ULTRASAT might be able to spot such a rare event.

The ULTRASAT proposal, which will be put forward for NASA HQ approval next year, is targeted to launch sometime in 2019. In the meantime, the Israel Space Agency has partly funded research on the feasibility study. The Israel Aerospace Industry is slated to construct the basic satellite, the firm Elop (headquartered in the Kiryat Weizmann Science Park, next to the Weizmann Institute) will assemble the telescopes and the Jet Propulsion Lab will provide the cameras to relay the images. Assembly of the satellite will take place in Israel, the launch into low orbit and subsequent communications will be provided by NASA, and the science will be the domain of researchers at the Weizmann Institute and Caltech. A truly collaborative initiative.

*(l-r) Sagi Ben-Ami, Prof. Oded Aharonson, Drs. Ilan Sagiv and Eran Ofek, Profs. Avishay Gal-Yam and Eli Waxman, and Jeremy Topaz and Ofer Lapid*

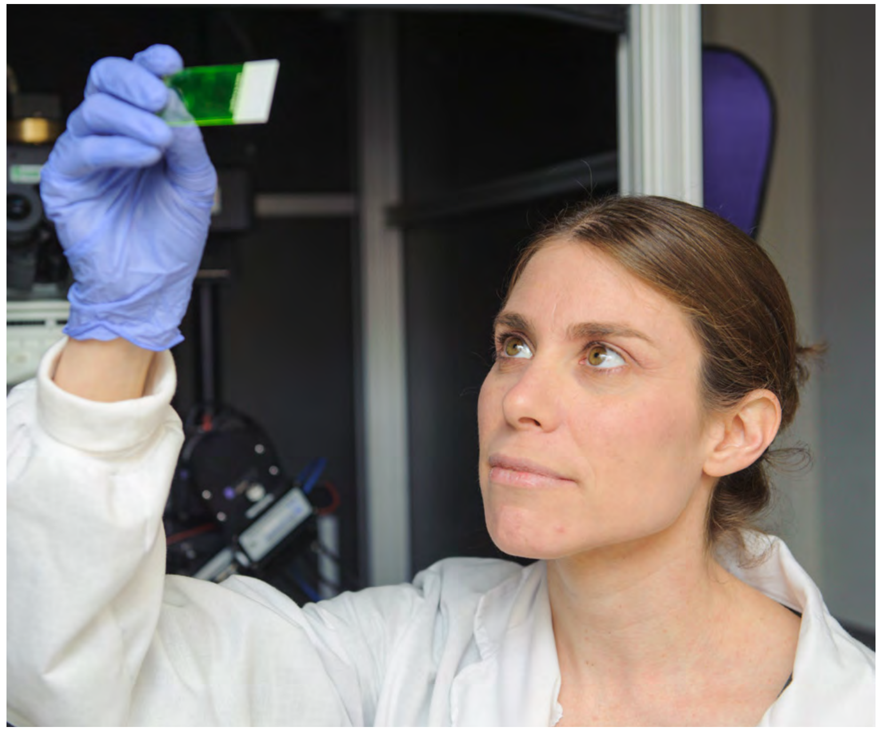
# Signs of Success

## Some 80 percent of Women in Science grant recipients attain faculty positions in Israel

Seven years after the launch of the donor-backed National Postdoctoral Program for Advancing Women in Science, the program, established and operated by the Weizmann Institute of Science, is evidencing major signs of success in its aim to nurture the careers of Israeli women scientists and thereby advance academic science overall in Israel. More than 80 percent of the women who participated in the program have attained faculty positions in Israeli academia: 22 out of the 27 women who completed their postdoctoral studies abroad. Of the remainder, two have accepted faculty appointments abroad and two are working in the Israeli high-tech industry.

The program funds 10 women scientists per year to do postdoctoral research overseas, each for a period of two years. The funds supplement often-small postdoctoral salaries and thus enable women and their families to relocate to the U.S. or Europe for this critical stage in a research scientist's career. Postdoctoral studies abroad have become a near-necessity in achieving a faculty position in scientific fields in Israel. While half of science students in Israel are women, the bottleneck in advancing to academic careers occurs at the postdoctoral stage, when many women graduates are reluctant to cause their families to relocate, which carries with it financial uncertainty.

The program is fully funded by Institute donors; among them are the Charles H. Revson Foundation in New York and the Clore Israel Foundation, in addition to many additional friends. A total of 75 women have participated in the program to date, with 27 having completed the program and the remainder still in the midst of their fellowships. Female graduates of all Israeli universities are eligible for the fellowship, and candidates are chosen on the basis of academic excellence. Single and married women are equally eligible to apply.



Dr. Michal Rivlin

"A nation's most valuable resource is the brainpower of its citizens. Today, in the knowledge-based economies of the West and, increasingly, of the globe, no country can afford to neglect half its talent," says Nessa Rappaport, Senior Program Officer of the Revson Foundation.

This success received international recognition when the Weizmann Institute was awarded the 27th Maria Aurèlia Capmany award by the City of Barcelona for the Institute's efforts to promote the careers of more women scientists.

The Weizmann Institute is the largest contributor of award recipients thus far, having sent a total of 32 women scientists to study abroad. The Institute and Ben-Gurion University have each recruited five program participants thus far.

In 2013-2014 alone, the Weizmann Institute recruited three new female scientists who were all previous recipients of the postdoctoral awards: Dr. Karen Michaeli of the Department of Condensed Matter Physics was a fellow in 2010 after obtaining her PhD from the Weizmann Institute, and did postdoctoral training at MIT. Dr. Michal Rivlin of the Department of Neurobiology, a 2009 fellow sponsored by the Revson Foundation, joined the Institute after a postdoctoral fellowship at the University of California at Berkeley. And Dr. Noam Stern-Ginnosar of the Department of Molecular Genetics, who won the fellowship in 2010, joined the Institute in January after a postdoctoral fellowship at the University of California, San Francisco.

*Prof. Michal Neeman (far left) and Prof. Varda Rotter (far right) with recipients of the postdoctoral fellowships and Dr. Susan Gasser (second on the left), recipient of the Weizmann Institute Women in Science Award*

In Israel, where academic careers for women begin at a later age than in most countries, the odds of career goals conflicting with the desire for parenthood are very high. In addition, since Israel is more remote from the hubs of scientific research in Europe and the U.S, it is now commonly accepted that scientists seeking to enter academia must spend a postdoctoral period abroad, to deepen networks and be exposed to the world's most advanced labs and cutting-edge research.

Rivlin recalls that, "the move to California was expensive. Flights for a family of five were costly and the cost of living was quite high. Since we came without a pre-obtained substantial fellowship and since my husband had difficulty finding work for the first few months, the award money from the National Postdoctoral Program for Advancing Women in Science really helped us keep our head above water until we got settled in."

Speaking at the Clore Lunch on November 4 upon receiving the Clore Prize, Dr. Noam Stern-Ginnosar said: "It is not easy to raise a family on a postdoc's salary, and the postdoc award made it possible for me to concentrate on my research knowing that my family was taken care of."

# Biotech Leaders Reflect on the Weizmann Institute

**The Weizmann Institute has been, and must continue to be, the leading incubator for both excellent ideas and excellent people in the life-science-focused industry in Israel.**

Weizmann Institute alumni are making their mark on the world of high-tech and biotech – in R&D as well as in leadership roles in companies that are shaping our future. We asked a few of them how they see the Weizmann Institute's influence both in their working lives and in their fields.

*Dr. Nitza Kardish (standing, left) and her coworkers*

*Dr. David Aviezer*

*Dr. Roee Atlas*

*Dr. Lior Carmon*

David Aviezer, PhD, MBA, has been President and CEO of Protalix Biotherapeutics for the last 12 years. He received his PhD in molecular cell biology, in 1996, under the guidance of Prof. Avner Yayon.

Dr. Nitza Kardish is the CEO of Trendlines AgTech. She received her PhD in 2005, in plant genetics.

Dr. Lior Carmon is the founder and CEO of Vaxil BioTherapeutics Ltd. He received his PhD in 1999, under the guidance of Prof. Lea Eisenbach.

Dr. Roee Atlas is Director of Research and Development at KSCLabs Ltd. He completed his PhD in 2005 under the guidance of Prof. Irit Ginzburg.

### How did your time at the Weizmann Institute influence your career?

**Aviezer**: The Institute set my foundation in striving for scientific excellence: gaining the tools for focusing on the questions that need to be resolved, tackling them from several directions, and collaborating with fellow scientists in order to reach the desired outcome.

**Kardish**: To be an alumna/research fellow of the Weizmann Institute is an entry ticket – valued and honored everywhere you present yourself. At the Institute, I learned to choose and separate the wheat from the chaff; I learned the meaning of independent thought, team work and long-range thinking. All these things have found expression in my subsequent roles over the years, in research and in management.

**Carmon**: When I moved to the Weizmann Institute after my MSc, I chose a project that was somewhat industry-oriented, which excited me. After the hard work of the lab team, we succeeded in licensing our technology to an Israeli biotech company. I learned a lot from this process about industry-academia interaction and the potential for collaboration.

**Atlas**: In a way, my career path was created at the Institute. I was acquainted with the beauty of biology and basic research, yet also understood the importance of applied research and the mission to make people healthier through biotechnology and biomedicine. My mentor, Prof. Ginzburg – who sadly passed away – brought to my attention the importance of viewing one's research in the context of novel knowledge as well as providing medical solutions to diseases.

### How do you see the role of the Weizmann Institute in the future of Israeli science-based industry?

**Kardish**: The Institute has tremendous stores of knowledge, excellent researchers and an organization that is practiced in the art of commercializing knowledge. It should not forget its original charge to generate basic knowledge and, together with this, to continue to enable the creation of knowledge for industry.

**Atlas**: I believe Weizmann should take a major role as an "incubator" for novel developments from its research labs and fully support – financially and professionally – the initial steps of novel pharmaceuticals/bio-pharmaceutical development. Drug development carried out under the Weizmann "wings" at least up to phase I clinical development will be attractive to further financial investment and development by industrial companies. This "maturation in the Institute" model is the key to speeding the drug-to-market timeline and the drug's success in providing substantial cures to patients.

**Aviezer**: The Weizmann Institute has been, and must continue to be, the leading incubator for both excellent ideas and excellent people in the life-science-focused industry in Israel. Good ideas for new drugs and technologies come from high quality science – as long as the Institute continues to appreciate the importance of the cross-talk between the industry and academia.

**Carmon**: In addition to the role of the Weizmann Institute as a fount for the basic scientific infrastructure of young biotech companies, it should also be a key supplier of innovative technologies that will turn into new start-up companies. It acts as a center of knowledge and innovation, and when I have the time, I enjoy attending lectures at the Institute.

### Where do you see yourself in 10 years?

**Carmon**: I hope to be able to have at least advanced to the market our lead product, ImMucin, which is a cancer vaccine, – for the patients' benefit. At that point I will relax and take my time to consider my next move. Maybe it will be something simpler than biotech: I have an old dream of opening my own little coffee shop, where I will do the cooking.

**Kardish**: It's hard to say... I will be 65! Maybe on a trip around the world...

**Aviezer**: Hopefully, doing something that I enjoy which I am good at…

**Atlas**: As a leader of a group of bio-pharmaceutical/pharmaceutical start-ups, employing innovative thinking and methodical management to chaperon ideas for medical treatment into approved drugs and to the patient's bedside.

# Thank You

We are grateful to the individuals and foundations that support the work of the scientists mentioned in this issue of Weizmann Magazine.

**Prof. Lia Addadi**
The Gerhardt M.J. Schmidt Minerva Center on Supramolecular Architecture
Ilse Katz Institute for Material Sciences and Magnetic Resonance Research
Carolito Stiftung
**Prof. Addadi** is the incumbent of the Dorothy and Patrick Gorman Professorial Chair

**Prof. Oded Aharonson**
The Helen Kimmel Center for Planetary Science, which he heads
J & R Center for Scientific Research
Estate of Joseph and Erna Lazard

**Dr. Ido Amit**
M.D. Moross Institute for Cancer Research
The Abramson Family Center for Young Scientists
The Wolfson Family Charitable Trust
Abisch Frenkel Foundation for the Promotion of Life Sciences
Leona M. and Harry B. Helmsley Charitable Trust
Sam Revusky, Canada
Drs. Herbert and Esther Hecht, Beverly Hills, CA
Estate of Ernst and Anni Deutsch
Estate of Irwin Mandel
**Dr. Amit** is the incumbent of the Alan and Laraine Fischer Career Development Chair

**Prof. Ruth Arnon**
Leona M. and Harry B. Helmsley Charitable Trust

**Prof. Ilya Averbukh**
**Prof. Averbukh** is the incumbent of the Patricia Elman Bildner Professorial Chair of Solid State Chemistry

**Prof. Israel Bar-Joseph**
Carolito Stiftung
Estate of Toni Fox
**Prof. Bar-Joseph** is the incumbent of the Jane and Otto Morningstar Professorial Chair of Physics

**Prof. Nir Davidson**
Mary and Tom Beck-Canadian Center for Alternative Energy Research
Leona M. and Harry B. Helmsley Charitable Trust
Wolfson Family Charitable Trust
Crown Photonics Center
Friends of the Weizmann Institute of Science in Memory of Richard Kronstein
**Prof. Davidson** is the incumbent of the Peter and Carola Kleeman Professorial Chair of Optical Sciences

**Dr. Barak Dayan**
The Benoziyo Endowment Fund for the Advancement of Science
Estate of David Guerchenson
Estate of Olga Klein Astrachan
**Dr. Dayan** is the incumbent of the Joseph and Celia Reskin Career Development Chair

**Prof. Hadassa Degani**
**Prof. Degani** is the incumbent of the Fred and Andrea Fallek Professorial Chair in Breast Cancer Research

**Prof. Nava Dekel**
Jeanne and Joseph Nissim Foundation for Life Sciences Research
Dwek Family Biomedical Research Fund
The Richard F. Goodman Yale/Weizmann Exchange Program
The Maurice and Vivienne Wohl Biology Endowment
Estate of John Hunter
**Prof. Dekel** is the incumbent of the Philip M. Klutznick Professorial Chair of Developmental Biology

**Prof. Eytan Domany**
Kahn Family Research Center for Systems Biology of the Human Cell, which he heads
Mario Negri Institute for Pharmacological Research - Weizmann Institute of Science Exchange Program
The Leir Charitable Foundations
Mordechai Segal, Israel
Louis and Fannie Tolz Collaborative Research Project
**Prof. Domany** is the incumbent of the Henry J. Leir Professorial Chair

**Prof. Yadin Dudai**
Irving Bieber, M.D. and Toby Bieber, M.D. Memorial Research Fund
Nella and Leon Benoziyo Center for Neurological Diseases
Carl and Micaela Einhorn-Dominic Brain Research Institute
Abramson Family Foundation
Marc Besen and the Pratt Foundation, Australia
Lisa Mierins Smith, Canada
**Prof. Dudai** is the incumbent of the Sara and Michael Sela Professorial Chair of Neurobiology

**Dr. Nirit Dudovich**
Crown Photonics Center
Jay Smith and Laura Rapp Laboratory for Research in the Physics of Complex Systems
Jacques and Charlotte Wolf Research Fund
The Enoch Foundation
Friends of the Weizmann Institute in memory of Richard Kronstein
European Research Council

**Prof. Lea Eisenbach**
Jeanne and Joseph Nissim Foundation for Life Sciences Research
Victor Pastor Fund for Cellular Disease Research
The Pearl Welinsky Merlo Foundation Scientific Progress Research Fund
Lewis Family Charitable Trust
Estate of John Hunter
**Prof. Eisenbach** is the incumbent of the Georg F. Duckwitz Professorial Chair of Cancer Research

**Prof. Bat Sheva Eylon**
The Maurice and Ilse Katz Center for Science Teaching, which she heads
Rothschild Caesarea Foundation
Abraham and Sonia Rochlin Foundation
**Prof. Eylon** is the incumbent of the Chief Justice Bora Laskin Professorial Chair of Science Teaching

**Prof. Avishay Gal-Yam**
Helen and Martin Kimmel Award for Innovative Investigation
Nella and Leon Benoziyo Center for Astrophysics
Yeda-Sela Center for Basic Research
Peter and Patricia Gruber Award
Friends of the Weizmann Institute in memory of Richard Kronstein
Lord Sieff of Brimpton Memorial Fund

**Dr. Jacob Hanna**
Pascal and Ilana Mantoux, Israel/France
The Benoziyo Endowment Fund for the Advancement of Science
Leona M. and Harry B. Helmsley Charitable Trust
The Sir Charles Clore Research Prize
Erica A. Drake and Robert Drake
European Research Council
Fritz Thyssen Stiftung

**Prof. Haim Harari**
**Prof. Harari** is the incumbent of the Annenberg Professorial Chair of High Energy Physics

**Prof. Moty Heiblum**
Joseph H. and Belle R. Braun Center for Submicron Research, which he heads
The Gruber Center for Quantum Electronics, which he heads
The Willner Family Leadership Institute for the Weizmann Institute of Science
Dan and Herman Mayer fund for Submicron Research
Wolfson Family Charitable Trust
European Research Council
Estate of Olga Klein Astrachan
**Prof. Heiblum** is the incumbent of the Alex and Ida Sussman Professorial Chair of Submicron Electronics

**Dr. Tali Kimchi**
Nella and Leon Benoziyo Center for Neurological Diseases
Murray H. & Meyer Grodetsky Center for Research of Higher Brain Functions
The Joan and Jonathan Birnbach Family Laboratory Fund
Abisch Frenkel Foundation for the Promotion of Life Sciences
Peter and Patricia Gruber Awards
Mike and Valeria Rosenbloom through the Mike Rosenbloom Foundation
Harris Foundation for Brain Research
Estate of Fannie Sherr
**Dr. Kimchi** is the incumbent of the Jenna and Julia Birnbach Family Career Development Chair

**Prof. Ilan Lampl**
The Henry Chanoch Krenter Institute for Biomedical Imaging and Genomics
Marianne Manoville Beck Laboratory for Research in Neurobiology in Honor of her Parents
Jeanne and Joseph Nissim Foundation for Life Sciences Research
Adelis Foundation
Estate of Dorothy Geller
Estate of Florence and Charles Cuevas

**Prof. Ulf Leonhardt**
Jinich Postdoctoral Fellowship

**Prof. Shimon Levit**
**Prof Levit** is the incumbent of the Harry Kweller and Kathleen Kweller Professorial Chair of Condensed Matter Physics

# Thank You

**Dr. Karen Michaeli**
National Postdoctoral Award Program for Advancing Women in Science
The Gurwin Family Fund for Scientific Research

**Prof. Michal Neeman**
The Henry Chanoch Krenter Institute for Biomedical Imaging and Genomics, which she heads
Clore Center for Biological Physics, which she heads
Kirk Center for Childhood Cancer and Immunological Disorders, which she heads
Leona M. and Harry B. Helmsley Charitable Trust
Carolito Stiftung
The Allyson Kaye Charitable Trust
European Research Council
Foundation Adelis
**Prof. Neeman** is the incumbent of the Helen and Morris Mauerberger Professorial Chair in Biological Sciences

**Dr. Eran Ofek**
Willner Family Leadership Institute
Ilan Gluzman, Secaucus, NJ
**Dr. Ofek** is the incumbent of the Arye and Ido Dissentshik Career Development Chair

**Prof. Dan Oron**
Crown Photonics Center
Leona M. and Harry B. Helmsley Charitable Trust
European Research Council

**Dr. Roee Ozeri**
Crown Photonics Center
Yeda-Sela Center for Basic Research
Wolfson Family Charitable Trust
Martin Kushner Schnur, Mexico
Friends of the Weizmann Institute of Science in Memory of Richard Kronstein

**Dr. Rony Paz**
Sylvia Schaefer Alzheimer's Research Fund
Ruth and Herman Albert Scholars Program for New Scientists
Irving and Dorothy Rom Family Discovery Endowment Fund
European Research Council
Pascal and Ilana Mantoux, Israel/ France
Gary and Kary Leff, Calabasas, CA
**Dr. Paz** is the incumbent of the Beracha Foundation Career Development Chair

**Prof. Yehiam Prior**
Leona M. and Harry B. Helmsley Charitable Trust
Carolito Stiftung
The Willner Family Leadership Institute for the Weizmann Institute of Science
CNRS - Centre National de la Recherche Scientifique
Mr. Luis Stuhlberger, Mexico
**Prof. Prior** is the incumbent of the Sherman Professorial Chair of Physical Chemistry

**Dr. Michal Rivlin**
The Benoziyo Endowment Fund for the Advancement of Science
Revson Awards towards the National Postdoctoral Award Program for Advancing Women in Science

**Prof. Varda Rotter**
Women's Health Center, which she heads
Leir Charitable Foundations
Paul Sparr Foundation
**Prof. Rotter** is the incumbent of the Norman and Helen Asher Professorial Chair of Cancer Research

**Prof. Yardena Samuels**
The Henry Chanoch Krenter Institute for Biomedical Imaging and Genomics
Louis and Fannie Tolz Collaborative Research Project
Laboratory in the name of M.E.H Fund established by Margot and Ernst Hamburger
Dukler Fund for Cancer Research
European Research Council
De Benedetti Foundation-Cherasco 1547
Peter and Patricia Gruber Awards
Gideon Hamburger, Israel
Estate of Alice Schwarz-Gardos
Estate of John Hunter
**Prof. Samuels** is the incumbent of the Knell Family Professorial Chair.

**Prof. Michael Sela**
Joel and Mady Dukler Fund for Cancer Research
Comisaroff Family Trust
Paul Sparr Foundation
**Prof. Sela** is the incumbent of the W. Garfield Weston Professorial Chair of Immunology

**Prof. Aldo Shemesh**
de Botton Center for Marine Science, which he heads
Helen Kimmel, New York, NY
**Prof. Shemesh** is the incumbent of the Barry Rymer Family Professorial Chair

**Prof. Yaron Silberberg**
Crown Photonics Center, which he heads
Cymerman - Jakubskind Prize
The Wolfson Family Charitable Trust
European Research Council
**Prof. Silberberg** is the incumbent of the Harry Weinrebe Professorial Chair of Laser Physics

**Dr. Rotem Sorek**
Abisch Frenkel Foundation for the Promotion of Life Sciences
European Research Council
Leona M. and Harry B. Helmsley Charitable Trust
Hugo and Valerie Ramniceanu Foundation
Dr. Dvora and Haim Teitelbaum Endowment Fund
Mr. Martin Kushner Schnur in honor of Fanny Kushner
Estate of Samuel and Alwyn J. Weber
**Dr. Sorek** is the incumbent of the Rowland and Sylvia Schaefer Career Development Chair in Perpetuity

**Prof. Ady Stern**
Wolfson Family Charitable Trust

**Dr. Noam Stern-Ginossar**
The Benoziyo Endowment Fund for the Advancement of Science
The Sir Charles Clore Research Prize
National Postdoctoral Award Program for Advancing Women in Science
Norman Huber, Liechtenstein

**Dr. Ravid Straussman**
Hymen T. Milgrom Trust Donation Fund
Fabrikant-Morse Families Research Fund for Humanity

**Dr. Berta Strulovici**
Head of the Nancy and Stephen Grand Israel National Center for Personalized Medicine

**Prof. Amos Tanay**
Helen and Martin Kimmel Award for Innovative Investigation
Pascal and Ilana Mantoux, Israel/France
The Wolfson Family Charitable Trust
The Rachel and Shaul Peles Fund for Hormone Research
Estate of Evelyn Wellner

**Prof. Milko Van Der Boom**
Mary and Tom Beck-Canadian Center for Alternative Energy Research
Leona M. and Harry B. Helmsley Charitable Trust
The Jacob and Charlotte Lehrman Foundation
Nathan Minzly Alternative Energy Research Fund
Luis Stuhlberger, Brazil
**Prof. Van Der Boom** is the incumbent of the Bruce A. Pearlman Professorial Chair in Synthetic Organic Chemistry

**Dr. Assaf Vardi**
Charles Rothschild, Brazil
Roberto and Renata Ruhman, Brazil
Luis Stuhlberger, Brazil
Lord Sieff of Brimpton Memorial Fund
European Research Council
Estate of Samuel and Alwyn J. Weber
**Dr. Vardi** is the incumbent of the Edith and Nathan Goldenberg Career Development Chair

**Prof. Eli Waxman**
Nella and Leon Benoziyo Center for Astrophysics, which he heads
Friends of the Weizmann Institute in memory of Richard Kronstein
**Prof. Waxman** is the incumbent of the Max Planck Professorial Chair of Quantum Physics

**Dr. Ofer Yizhar**
The Henry Chanoch Krenter Institute for Biomedical Imaging and Genomics
Clore Center for Biological Physics
Adelis Foundation
Carolito Stiftung
Iby and Aladar Fleischman Foundation
The Candice Appleton Family Trust
Minna-James-Heineman Stiftung
The Irving B. Harris Fund for New Directions in Brain Research
The Joseph D. Shane Fund for Neurosciences
Corinne S. Koshland Equipment Endowment Fund
European Research Council
Irving Bieber, M.D. and Toby Bieber, M.D. Memorial Research Fund
**Dr. Yizhar** is the incumbent of the Gertrude and Philip Nollman Career Development Chair

# 10 THINGS we didn't know about **Abba Eban**

Abba Eban, 1915-2002, was Israel's Foreign Affairs Minister, Education Minister, Deputy Prime Minister, and Ambassador to the United States and to the United Nations. He was also Vice President of the United Nations General Assembly and President of the Weizmann Institute of Science. Known for his oratorical skill, he is remembered for his speech to the UN General Assembly in support of partition. He is also the author of a number of books, among them *Abba Eban: An Autobiography*, 1977, and *Heritage*: *Civilization and the Jews*, 1984.

1. Eban's mother was secretary to the journalist, author and poet Nahum Sokolov, who was the fifth president of the World Zionist Congress. His cousin on his mother's side is the neurologist and writer Oliver Sacks.
2. He was born Aubrey Solomon. His father, Avram Solomon, died young in South Africa, where Eban was born. His mother remarried, and Eban was not told his real name until later. Aubrey was then hebraicized to Abba.
3. For three years he served as both president of the Weizmann Institute and Deputy Prime Minister of Israel, under Levi Eshkol. (Weizmann Institute 1959-1966; Deputy Prime Minister 1963-1966.)
4. He was a talented mimic; occasionally, upon returning from official meetings, he would entertain his friends and neighbors at the Weizmann Institute with impersonations of various politicians.
5. He disliked small talk but paid attention to what people were saying. In a meeting at the Institute with the President of Congo, he is reported to have sat for a long time without uttering a word. He then rose and gave a long speech in French (for the benefit of his guest), which revealed he had not only heard but absorbed every word of the previous discussion.
6. Besides his native tongue – British English – he was fluent in Farsi, Hebrew and Arabic, as well as other languages.
7. His son, Eli Eban, is a renowned clarinetist and professor of music at the University of Indiana. He had been first clarinet in the Israel Philharmonic Orchestra, and had occasionally performed in small concerts in the home of the Weizmann Institute's Prof. Israel Schechter.
8. He was the right-hand man of Dr. Chaim Weizmann and Moshe Sharett in the UN debates over the 1947 partition plan. The Saudi representative summed up the filibuster staged by Eban to give others time to garner support for the plan by saying that the speech was worth six months of university studies. Politics for the Jews, he added, was less of a gamble and more of a science.
9. In his classic column, Israeli writer Ephraim Kishon satirized Eban's famous UN speech, including the British representative who checked his dictionary and the Belgian who listened to the simultaneous translation in Chinese, hoping to understand it better. A quote: "Abba Eban's speech also has content. But who has time for this detail? The main thing is to get the most points in the quiz."
10. After retiring from politics Eban went into television: He was chief consultant and narrator of the nine-part television program *Heritage*, and editor-in-chief and narrator of the five-part television series *Personal Witness: A Nation Is Born.* He also completed *The Brink of Peace,* a film on the Middle East peace process, for the PBS television network in the US.