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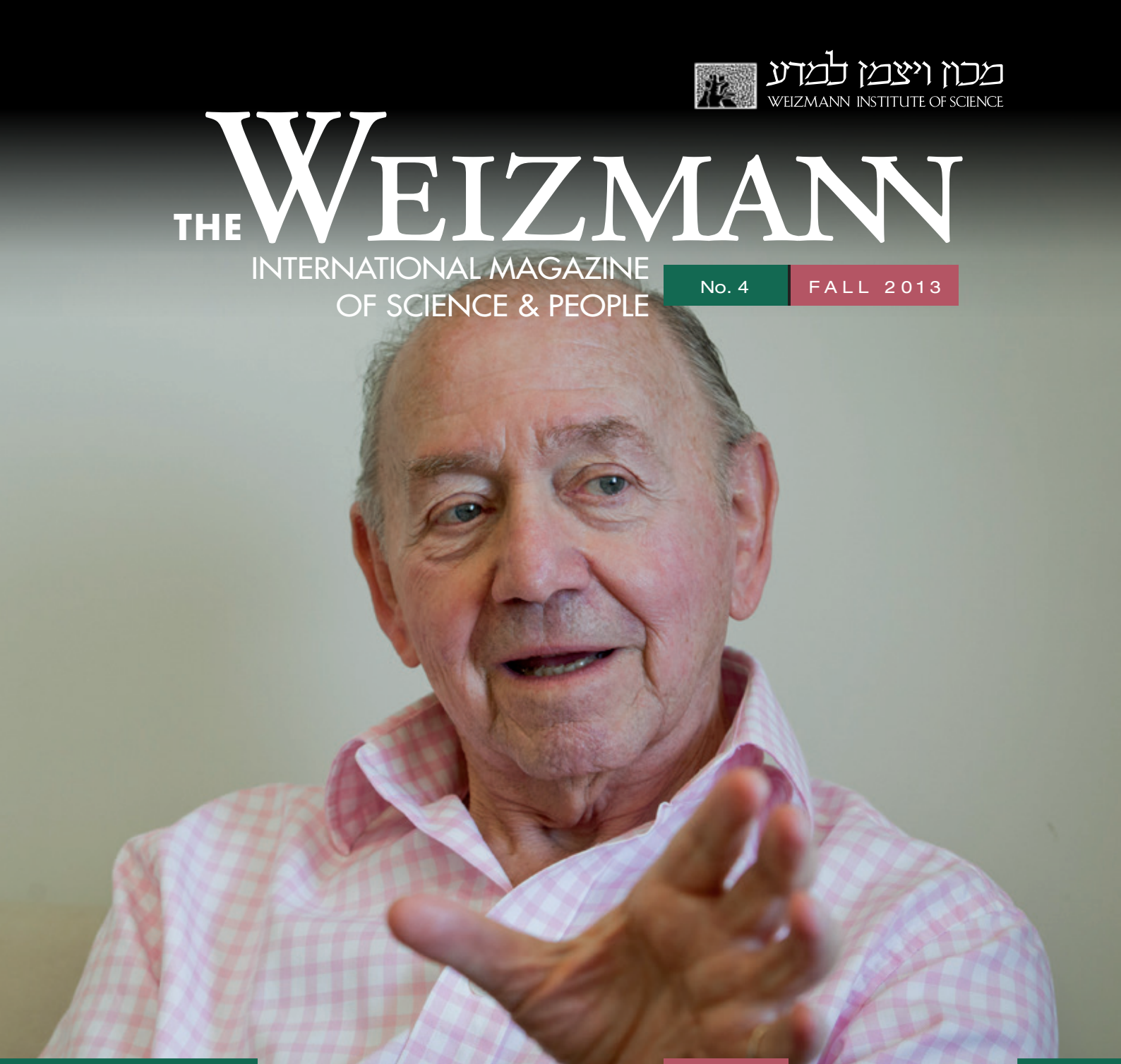

Cover Story

Mandy Moross: A Steward Over Time

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From the President

Albert Einstein once said: "Life is like riding a bicycle. To keep your balance, you must keep moving." Every time I hear this quote, I feel it perfectly fits the spirit of the Weizmann Institute: If we want to keep our balance, we must keep moving. In fact, for a scientific institution, not moving is even more treacherous: Not only will it fall, it can be much more difficult to get itself back up on the wheels. This is because, unlike the bicycle, which only needs a strong rider to keep moving, an institute like Weizmann requires a good number of highly qualified people to keep propelling it forward.

To stretch the metaphor, the Institute is like a bicycle with a lot of riders: One of the major difficulties inherent in this is that they all need to be riding in step, so that not only does the thing move, it also travels in a well-defined direction. Otherwise, we might be keeping our balance, but we will be going in circles. And going in circles, for a scientific institution, is simply "reinventing the wheel."

One of the most outstanding features of the Weizmann Institute is that even though our many "riders" have very different skills and backgrounds – from gardeners to scientists, from technicians to accountants, from students to board members – we have, for the last 64 years, succeeded in keeping our balance and never losing our way. Every day, each and every one of us gets out of bed in order to push the limits of scientific knowledge, to keep discovering what the world is made of and to renew our attempt to understand what life is all about. In this magazine, you will find that we are moving into ever new territory. That is natural: While riding our "bicycle," we encounter a continuously changing landscape. New discoveries are always made when fresh landscapes are visited.

I wish all of you a happy new year, "Shana Tova." Keep pedaling, and don't forget that there are many gears – on a bike as well as in life. To paraphrase a famous poem: We use the gears less pedaled/ And that has made all the difference.

Daniel Zajfman

CONTENTS

Mice in a Big Brother *setup develop social structures*

A Mouse in the House

Here is a version of *Big Brother* that won't be coming to your TV screen anytime soon: Dr. Tali Kimchi, incumbent of the Jenna and Julia Birnbach Family Career Development Chair, places groups of mice together in a large "house" in her lab and films their every action day and night. Together with Dr. Ofer Feinerman, incumbent of the Shlomo and Michla Tomarin Career Development Chair, she and her team developed a setting that was somewhat natural but still enabled them to observe and analyze in precise detail what each mouse was doing at any given time. Over periods of days to months, they watched as individual and social behavior patterns led to the formation of a mouse social structure.

Among other things, they found that a caste system developed as one mouse became the dominant leader of the group while sub-alpha mice waited for signs of weakness that might allow them to take his place. Using an automated system to identify behavioral patterns, the researchers found they were able to predict such typical social phenomena as hierarchy as well as know the gender and strain of the mice.

One of the study's more interesting findings emerged from experiments with mice that had been bred to exhibit signs of autism – little social engagement and compulsive behavior patterns. When the house residents consisted solely of male "autistic" mice, leaders either did not arise or were quickly overthrown.

These findings suggest that observing the social structures of mice can reveal much that is common to all types of social animals, including humans. Such research may be especially useful for investigating the societal aspects of disorders that affect the group order, including autism and schizophrenia.

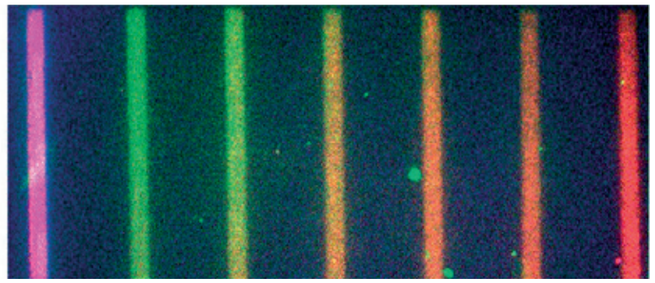
"Cell on a Chip" Produces Proteins

Can we build an artificial cell – one that will carry out such functions of natural living cells as gene expression, protein production and molecular interactions? Prof. Roy Bar-Ziv and his research team created a simplified, two-dimensional, cell-like system on a glass chip that suggests this feat may be possible in the future.

Using a technique they had developed in previous experiments, Bar-Ziv and his team attached strands of DNA to one part of the chip. To another part, they affixed antibodies for trapping proteins – the products of the DNA expression. Because the DNA encoded a green fluorescent marker, when the experiment succeeded and proteins were produced, they showed up as a green glow on the antibody side of the chip.

Further experiments in Bar-Ziv's lab elaborated on the idea. In one version, the researchers used a viral gene that encodes proteins which roll up into tubes. Sure enough, when they observed the chips under an electron microscope, they saw a forest of minuscule tubes populating the antibody section. In another, they added a gene encoding a red fluorescent protein on top of the ones for green fluorescent proteins. They found that the colored proteins competed for the antibodies, with the green ones ending up closer to their genes and the red ones trapped farther away.

These chips, says Bar-Ziv, demonstrated a system for observing protein production and activities in real time. But he envisions future applications, in which such miniature cell-like systems could provide the basis for techniques to create complex, active protein structures on demand.



Protein interaction on a chip: Red proteins concentrated more on the right, farther from the chip-bound genes, while green proteins are more highly concentrated on the left, closer to the genes that encode them

Limits to Growth

What makes a lettuce leaf grow to the size of a salad plate, or a clover leaf to the size of a fingernail? Prof. Yuval Eshed, the Jacques Mimran Professor, and his group investigated this question with the help of the standard lab plant *Arabidopsis thaliana*, a type of mustard cress that normally has relatively tiny leaves.

They began with proteins they had discovered in previous research into the very first steps of leaf growth, when the cells of the nascent leaf differentiate into top and bottom. When the plants were genetically engineered to produce only top or bottom cells, the leaves did not grow, and a number of proteins normally produced in healthy leaves were not generated in the miniature ones.

Assuming that these proteins were involved in leaf growth, the researchers created new plants, each overproducing one of these proteins. To their surprise, about half of the proteins appeared to have no effect on leaf size, while the other half reduced it.

The next step was to create plants that did not produce various members of the growth-suppressing protein family they had identified. Now the leaves of their *Arabidopsis* grew larger and larger, until they more resembled lettuce or kale than cress. Further research revealed the precise mechanism by which these proteins limit leaf growth.

The findings, says Eshed, have overturned some basic assumptions about the plant's mechanisms for regulating leaf size. Growth appears to be the "default setting," so it does not require a lot of mechanisms to promote it. Putting the brakes on growth, on the other hand, is tightly regulated. It depends on such diverse factors as the availability of water or nutrients, cold, heat or daylight, and many regulatory factors may be involved.

Plant on the left is normal, center and right are missing factors that limit growth

Expanded GeneCards Database Finds a New Framework

GeneCards, the online, comprehensive database of human genes, nearly doubled in size following a recent study carried out in the laboratory of Prof. Doron Lancet, the Ralph D. and Lois R. Silver Professor of Human Genomics and Head of the Crown Human Genome Center.

GeneCards, which was first developed at the Weizmann Institute in 1996 by Lancet and his team, offers an easy-to-use web-card format for each gene. Dr. Frida Belinky, a postdoctoral researcher in Lancet's laboratory, and her colleagues have now added information on non-coding sequences (ncRNA) – genetic information that does not get translated into proteins but nonetheless plays a number of important roles in both health and disease. To create the additional sections, Belinky and the team integrated and unified information from 15 different ncRNA databases.

GeneCards and its sister database, MalaCards, which offers a similar web-card format for information on diseases, are now included in the computerized diagnostic and genomic analysis toolkits offered by Appistry, Inc. Appistry recently entered into a partnership with LifeMap Sciences, Inc., which is licensed by Yeda Research and Development, the technology transfer arm of the Weizmann Institute, to market GeneCards and MalaCards. Lancet's GeneCards team, headed by Marilyn Safran, continues to develop and maintain the databases at the Weizmann Institute.

Dr. David Warshawsky, CEO of LifeMap, says: "The combination of GeneCards' and MalaCards' comprehensive gene- and disease-related knowledge with the analysis workflow offered by Appistry will greatly enhance the potential for improved diagnosis, prevention and treatment of devastating conditions."

A Steward Over Time

Mandy Moross looks back on his long relationship with the Weizmann Institute and why it is Israel's 'jewel in the crown'

Since his first visit to the campus in 1956, Mandy Moross has witnessed the transition of the Weizmann Institute to an institution whose scientific accomplishments and technology transfer successes "are massive relative to its size," he says. Today, as Chairman of the International Board – of which he has been a member for more than three decades – helping steward that transformation successfully while maintaining the character of the Institute has become an essential and stimulating task.

Moross, 82, says the Institute is today "in its prime." And he would know: Though he resides in London, he is intricately familiar with the Institute and can expound on its challenges, goals and history, not unlike a US president giving a State of the Union address. Mandy and his wife Edna have also given generously to the Weizmann Institute throughout the years; their 1998 gift to establish the M.D. Moross Institute for Cancer Research, for instance, was the biggest-ever philanthropic donation received by the Weizmann Institute up to that time. And their legacy of leadership and giving has been conveyed to their children.

Born and raised in Johannesburg, South Africa – his father was a medical doctor who instilled in him an interest in science – Moross received his undergraduate education in science at Witwatersrand University and enrolled in Harvard Business School at the young age of 19. After graduating, he worked in the UK for Imperial Chemical Industries, married Edna and went back to South Africa, where he worked in the mining industry. In 1970, eschewing apartheid, the family moved back to England.

During his first trip to Israel, shortly after the Suez Crisis in 1956, he visited fellow South African Prof. Peter Hillman, a professor of physics at the Weizmann Institute, where Hillman later headed the Nuclear Physics Department. His meeting with Prof. Amos de-Shalit, who was to become director-general of the Weizmann Institute, made a profound impression on Moross.

> ***"I learned much from these relationships and began to understand Israel, what it represented, its challenges and potential"***

In 1963, he came to Israel to meet with Ephraim Ilin, who built Israel's first car assembly plant. He also met Benjamin Gibli, who was Director of Military Intelligence in the Israel Defense Forces intelligence branch. These meetings were the start of long-term friendships. Gibli introduced him to Moshe Dayan, who was Chief of Staff at the time, and that, too, developed into a lasting friendship. "I learned much from these relationships and began to understand Israel, what it represented, its challenges and potential," he recalls. Meeting "Dayan, the charismatic soldier, and Gibli (who had been engaged in what became known as the Lavon Affair, Israel's covert operation in Egypt intended to convince Britain not to withdraw its occupying force in Egypt), coupled with my exposure to the cerebral power at the Weizmann Institute and its exceptional campus, was the start of my meaningful relationship with Israel and Weizmann."

A commitment to the narrative of Israel and the Jewish people

The Moross' first major gift to the Weizmann Institute came in 1981, with the establishment of a professorial chair in honor of Mandy's father – the Dr. Hymie Moross Professorial Chair – and a year later Mandy was elected to the Board of Governors for the first time. Prof Tamar Flash, who explores motor control in humans and the use of robotics, is the current incumbent. The family's interest in robotics grew and led to the establishment of the Moross Laboratory for the Study of Vision Research and Robotics in 1996, where Prof. Shimon Ullman, the Ruth and Samy Cohn Professor of Computer Sciences, is defining the computations underlying vision and motor control. These studies are leading to a better understanding of the human brain and to the development of a new generation of intelligent and

Edna and Mandy Moross

"At the center of his passion for Israel is the Weizmann Institute"
David Moross

useful computer systems.

The Morosses also acquired the original written correspondence between Dr. Chaim Weizmann and his UK scientist colleague Harold Davis, and donated it to the Institute where it is housed in the archives at Yad Chaim Weizmann. In another tribute to the memory of Dr. Chaim Weizmann, they responded positively to a request from personal friend and Institute supporter David Sieff to fund the restoration of Dr. Weizmann's laboratory, which is located in the Daniel Sieff building. This "fascinating project," says Moross, entailed searching for scientific instruments that were used at the time. The lab is a point of interest for many campus guests.

It is the Morosses' firm belief that the fate of the Jewish people and that of the State of Israel are interdependent. It is this belief that has motivated their strong feelings for Israel. In 1979, the Morosses funded the establishment of a still-thriving community center in Jerusalem's Old City. They were early supporters of the Israel Museum in Jerusalem and are members of its Directors' Circle. "Our children share our feelings about Israel, and Weizmann in particular," says Mandy. "Edna and I could not wish to be more richly rewarded."

Their son David, who lives in New York and is a member of the International Board, agrees that his father's passion rubs off of on him and his other siblings: Karen Siem (who is also a Board member), Dominic and Philip. "In the last 20 years, in tandem with my father's years of deepening involvement with the Weizmann Institute, many of our conversations and e-mail exchanges have involved the subject of Israel and the stimulating pursuit of answers for all of Israel's challenges and great opportunities. His passion has been a driver for all of us, his children and his grandchildren, in focusing our attention on Israel as the home of the Jewish people. And of course, at the center of his passion for Israel is the Weizmann Institute."

The importance of philanthropy was also transmitted to the four children "by osmosis," says Mandy.

His daughter Karen recalls the same: "Philanthropy was always part of the value system in our family – it is in our DNA. And at the heart of it has always been the Weizmann Institute, which he views as the jewel in Israel's crown." Karen is a generous supporter of women scientists at the Institute and its educational arm, the Davidson Institute of Science Education.

A steward over decades

Throughout the years, Mandy has made substantive changes to the management and financial well-being of the Institute. "There is always more in Mandy's questions than in many others' answers," says Institute President Prof. Daniel Zajfman.

As chair of what was then the Board of Governors, Mandy developed close relationships with the Institute presidents over the years, including Profs. Michael Sela and Haim Harari. The establishment of the M.D. Moross Institute for Cancer Research came in 1998, with the Moross family responding to the Institute's wish to consolidate its vast and diverse cancer research initiatives under one roof. Mandy received a Ph.D *honoris causa* the same year.

"I believe Mandy saw in its creation two essential factors," says Prof. Yoram Groner, the Dr. Barnet Berris Professor of Cancer Research and Head of the Moross Institute for Cancer Research. "First, it would encompass the interdisciplinary research so central to the Institute's nature. And second, the establishment of such a funding mechanism, which gives support to early-stage research initiatives when external funding is still difficult to obtain, is a very effective tool to leverage the investment. It enables fledgling ideas to advance to a stage in development in which external grants can be obtained with relative ease."

In his years as president, Prof. Harari (now chairman of the Davidson Institute of Science Education) says Moross initiated important efforts to change the financial management of the Institute. "Mandy prodded and encouraged me to create a central endowment fund for the Institute similar to the Harvard Management Company and those of other American universities. At the time, our funds were invested in multiple places, and we needed centralization and a cohesive strategy," he says. That effort came to fruition in the form of the Weizmann Global Endowment Management (W-GEM) in 2002, which is managed in New York and functions like most university endowments, in which the interest supports the research and educational needs of the Institute. "Mandy's business acumen has guided us for many years and the creation of W-GEM was one of his major contributions," says Harari.

Moross chaired the search committee that selected Prof. Zajfman as president, whom Mandy calls a "tireless, extraordinary leader." In Zajfman's first years in office, Moross helped the management make key governance changes, including the creation of an Executive Board to make management more efficient and effective, and the transformation of the Board of Governors into the International Board, with a corresponding change in roles and responsibilities.

Then, in 2009, a new major gift from the family established the Moross School of Mathematics and Computer Sciences, one of the Feinberg Graduate School's five research schools. "We felt strongly about attracting the best students to the field, providing more of them with exposure to opportunities, the ability to participate in international conferences and better access facilities – thus adding to the quality of education so Israel can continue to be a world leader in computer science," he says.

He has high hopes for the future, which he rests on the high quality of the scientific talent. "The Institute does a superb job in recruiting the best young scientists to join the faculty," he says. "And time and again these Israelis come back to Israel (after their postdoctoral fellowships abroad), not only because the Institute makes offers that can closely compete with the best Western universities, but also because their families are in Israel and they want their children to grow up there. To many people who think Israel is under threat, this is an amazing and important thing for them to hear – that this country and this Institute have created the right conditions to bring back the top minds and for these people to educate the next generation of leading scientists."

Clockwise from top: Mandy Moross, Karen Siem; Dominic, Philip, Edna and David Moross

A history of commitment

Major gifts to the Weizmann Institute by Mandy and Edna Moross

- Dr. Hymie Moross Professorial Chair (1981)
- Dr. Chaim Weizmann letters (1989)
- Dr. Chaim Weizmann laboratory refurbishment (1993)
- Moross Laboratory for Vision Research and Robotics (1996)
- M.D. Moross Institute for Cancer Research (1998)
- Moross Research School of Mathematics and Computer Sciences (2009)

Turing Award to Prof. Shafi Goldwasser

This summer, Prof. Shafi Goldwasser became the third member of the Weizmann Institute to receive an A.M. Turing Award, the highest honor awarded internationally in the field of computer science. Goldwasser, who is also on the faculty of the Massachusetts Institute of Technology (MIT), received the award together with Prof. Silvio Micali of MIT.

Two influential papers written by Goldwasser and Micali in the 1980s laid many of the foundations of modern cryptography, and they became the basis of research fields that are active today. Their 1982 paper on "Probabilistic Encryption" introduced formal security definitions that are now the gold standard for security. In contrast to the deterministic encryption schemes that had been proposed until then, Goldwasser and Micali suggested randomized methods that could satisfy the most stringent security requirements. These were based on "reductionist proofs" in which an attack on security is translated into a fast algorithm for solving hard classical mathematical problems – for example, factoring integers.

This paper also introduced the "simulation paradigm" – a way to prove security in a system by asking whether an enemy could have simulated on his own any information gained in the employment of a cryptographic system. This paradigm has since become the most general method for proving the security of authentication methods, software protection schemes and cryptographic protocols that involve many participants, for example, electronic elections and auctions.

Zero-knowledge interactive proofs

Imagine an ATM machine that would not ask you to enter your PIN number, but would only need to verify that you, yourself know it. This is an example of a zero-knowledge proof. Another would be a method for enabling wary users working together over the Internet to compute joint functions while keeping their data secret from one another.

Goldwasser, Micali and Rackoff's 1985 paper on the subject was a radical departure from the idea of a classical mathematical proof, which can always be written down. A zero-knowledge proof, in contrast, is a sort of conversation in which a "prover" tries to convince a "verifier" that she knows the proof of a mathematical statement. The verifier can be convinced that the proof exists – without learning the proof itself – by the answers the prover gives to a series of random, but linked, questions.

In addition to providing a powerful cryptographic tool, the concept of interactive proofs has had a major impact of the field of complexity theory, enabling faster verification of mathematical proofs and giving mathematicians the ability to prove the "nonexistence" of classical proofs.

Turing Triple

The Institute's Prof. Amir Pnueli received a Turing Award in 1996 for his development of sophisticated methods for verifying the correctness and reliability of computer systems. His method was based on temporal logic in mathematics – the incorporation of time into mathematical reasoning. This tool, which can distinguish between things that are true at all times and those that are only true sometimes, is useful, among other things, in analyzing reactive systems in which the external environment affects the internal function of the system. He also developed mathematical tools for the control of hybrid systems – for example, factory production lines that include both discrete and continuous components – as well as improving the methodology of safety-critical system design.

Prof. Adi Shamir received a Turing Award in 2003, along with Ronald L. Rivest and Leonard M. Adelman, co-developers of the RSA algorithm for the delivery of encrypted codes and their decryption between parties that have never previously been in contact. First developed in 1977 when the three were at MIT, RSA encryption is based on the multiplication of very large prime numbers: Factoring the products cannot be completed by today's computers in a reasonable time. Today, RSA is still the main encryption algorithm used, among other things, in secure Internet transactions.

Prof. Shafi Goldwasser

Focus on INCPM
Young Scientists
and geopolitics of the Middle East

"No matter how complex the problems I presented them with, they always succeeded to come up with innovative ideas"
Maj. Gen. (res.) Amos Yadlin

Dr. Eran Elinav

Prof. Yardena Samuels

Dr. Shalev Itzkovitz

At the meeting of the Executive Board of the Weizmann Institute of Science in early May, members and others toured new laboratories of the Israel National Center for Personalized Medicine (INCPM). They also heard from some of the Institute's newest scientists about their research pursuits at a dinner that took place on the Weizmann House lawn.

Dr. Berta Strulovici, Director of the Israel National Center for Personalized Medicine, emphasized the unique nature of the INCPM – "as a research center that is integrated on all possible levels – including the experimental data," she said. Board members were also invited to join a tour of the Maurice and Vivienne Wohl Institute for Drug Discovery's temporary laboratory, guided by its head, Dr. Haim Barr. "We now have at hand the large spectrum of instrumentation for drug discovery – or what researchers call chemical biology – needed to meet the broad research demands of the Weizmann Institute and Israel in general," said Barr.

At the Weizmann House event, hosted by the Israeli Friends of the Weizmann Institute of Science, Prof. Yardena Samuels, the Knell Family Professor, spoke about her efforts to use genomics tools to study melanoma; she recently joined the Molecular Cell Biology Department, after heading the Cancer Genetics Branch of the US National Human Genome Research Institute at the NIH.

Physician-scientist Dr. Eran Elinav talked about his experience at both bedside and bench relating to the "amazing and intriguing interactions" that transpire inside the human gastrointestinal tract with the multitudes of microbes that inhabit it. And Dr. Shalev Itzkovitz, incumbent of the Philip Harris and Gerald Ronson Career Development Chair, described his work in the blossoming field of systems biology and his particular focus on the study of the design principles of mammalian tissues using his expertise in physics.

Former chief of intelligence for the Israel Defense Forces, Major General (res.) Amos Yadlin, talked at the event about Israel's security challenges. Speaking on the day of an air strike inside Syrian territory that reportedly targeted advanced Iranian missiles headed for Hezbollah – which was attributed to Israel by foreign media sources – Yadlin gave a message of no-panic. He also sent a calming message about the potential threat of chemical weapons, saying that they lack efficiency against a strong opponent such as Israel.

Amos Yadlin's military career spanned 40 years of service and more than 250 combat missions as a fighter pilot, including Operation Tamuz – the destruction of the Osirak nuclear reactor in Iraq, in 1981. He later became deputy commander of the air force and, finally, head of military intelligence. In this role, he played an active part in Israel's overt and covert campaign against the Iranian uranium enrichment centrifuges. Today he is the director of the Institute for National Security Studies, a think tank at Tel Aviv University.

His final message related to the talent of Israel's younger generation, which he witnessed first hand in his role as IDF intelligence chief. He said that no matter how complex the problems he presented them with, "they always succeeded to come up with innovative ideas."

News of the Solar System

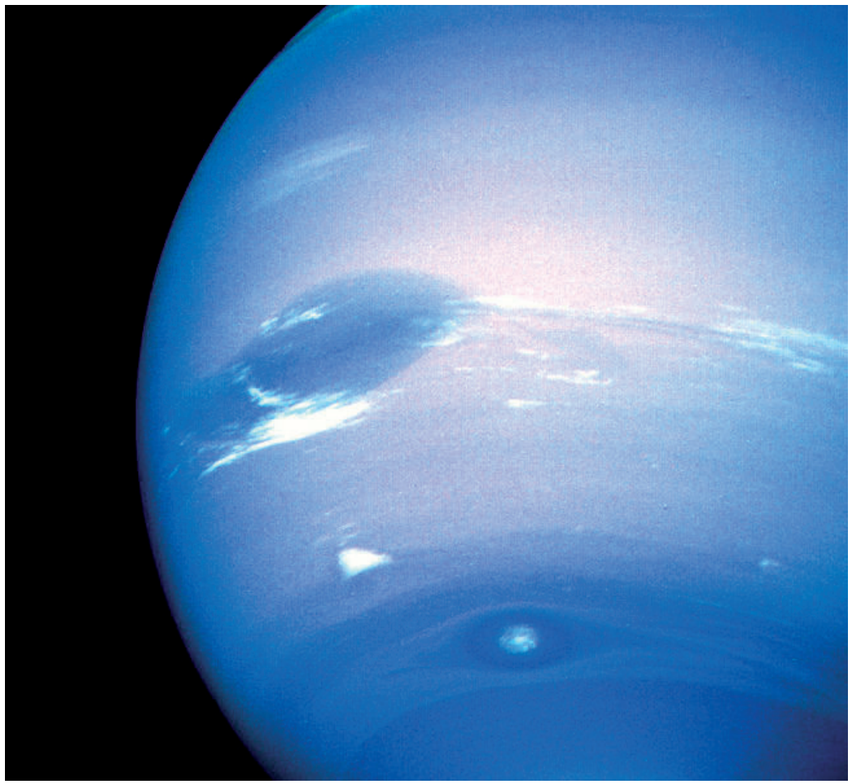
Dr. Yohai Kaspi

Moon map

What processes shape the planets and satellites with which we share our solar system? Members of the Weizmann Institute's Helen Kimmel Center for Planetary Science participated in two recent studies that are providing vital insights into the mysteries of giant gas planets and far-off moons.

For the past nine years, the Cassini spacecraft has been orbiting Saturn and, in addition to stunning images of that planet and its rings, it has been sending us flyby snapshots of two of Saturn's moons, Titan and Enceladus. To date, it has completed around 100 Titan flybys – providing enough topographical information to begin mapping the moon's surface, says the Weizmann Institute's Prof. Oded Aharonson. Aharonson, project leader Dr. Ralph Lorenz of the Applied Physics Laboratory, and other members of the Cassini RADAR team in the US and around the world, assembled the noodle-shaped strips of topographical data provided by Cassini's radar and altimetry equipment and interpolated them to produce a map of the entire moon. Titan thus joins an elite group: Besides Earth and our moon, only a few other such objects as Mercury, Venus and Mars have been mapped globally.

In contrast to the giant, ringed gas planet it orbits, Titan seems strangely Earth-like. Though its atmosphere is poisonous and methane flows on its surface instead of water, this distant moonscape has mountains, dunes and lakes, and its weather undergoes seasonal changes. One of the most interesting features of the Titan map, says Aharonson, is the elevation of its lakes. This can tell researchers whether those lakes are isolated – like high crater lakes – or whether liquid flows between them. In addition, as on Earth, Titan's topographical features directly affect its winds and rain, so the map should give scientists a good basis for modeling the moon's weather patterns.



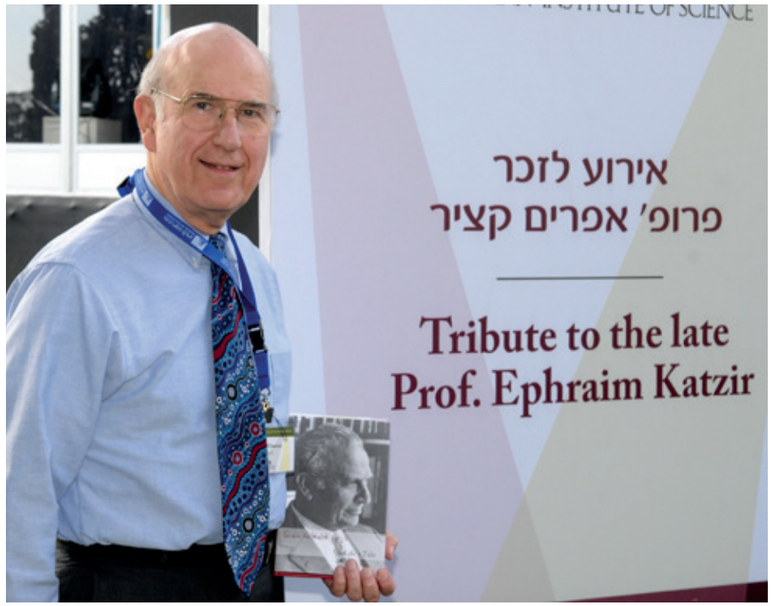
The spots seen on Neptune in this 1989 Voyager II image are giant storms

Planetary weather forecast

Dr. Yohai Kaspi, together with Prof. Oded Aharonson and researchers at Tel Aviv University and the University of Arizona, set out to answer a question about the weather on the two farthest-out planets, Uranus and Neptune. In the 1980s, Voyager II snapped close-up images of these giant gas planets, revealing super-storms as big around as Earth, with winds of up to 1000 km/h that last for years. But what happens under the surface? Are these extreme weather systems shallow features or do they arise from deep within the planets? Kaspi realized that a relatively simple measurement of these planets – that of their gravitational fields – could reveal the winds' depth.

The rapid rotation of these planets (days on Uranus and Neptune are about 17 and 16 hours, respectively) causes the winds to swirl around areas of high and low pressure. Using physical calculations to convert pressure to local fluctuations in the gases' mass, and thus to variations in the gravitational field, the researchers created a first-ever wind-induced gravity map of these planets. Generating a model of an idealized, becalmed planet's gravitational field and comparing the two revealed the contribution of winds to the outer planets' gravity maps. Further analysis showed that the winds are confined to a layer that is – at most – just a fraction of a percent of the planets' masses. In other words, although these worlds are utterly alien, their weather turns out to have some very Earth-like features. Kaspi plans to apply this method in greater detail when NASA's Juno mission to Jupiter begins measuring the gravitational field of that gas giant sometime in 2016.

Establishment of the Leah Omenn Career Development Chair



Dr. Gil Omenn

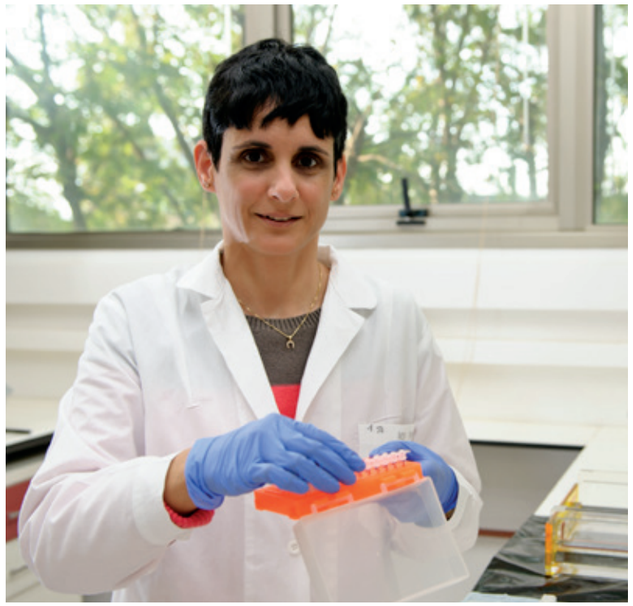
The new Leah Omenn Career Development Chair (CDC) was recently established in memory of Mrs. Leah Omenn by her children Dr. Gil Omenn of Ann Arbor, Michigan, and Neil Omenn of Boynton Beach, Florida. Mrs. Omenn, who passed away in May 2012, was "a remarkable woman," says Gil. "She attained a university education when it was a rarity for women to do so, and pursued a life dedicated to her family and the future of Israel."

Leah Omenn graduated pre-med from Temple University in the throes of the Great Depression and went on to teach science and German before marrying Dr. Leonard Omenn, a dentist. While raising her children and working with her husband, Omenn was very involved with the Jewish community both locally and in Israel. A lifetime Hadassah member, Omenn endowed the Dr. Leonard and Leah Omenn Program in Community Dentistry at the Hadassah Medical Center and the Hadassah/Hebrew University School of Dental Medicine in Jerusalem. This community dental program offers dental services to lower income populations in Israel and also provides assistance for complex dental cases that require special funding.

Omenn was also an admirer of Prof. Ephraim Katzir and the Weizmann Institute. The new CDC has been earmarked for incoming female scientists at the beginning of their scientific careers, a fitting legacy for a woman who was trained in the sciences.

Dr. Ayelet Erez, who is the first incumbent of the Leah Omenn CDC, joined the Weizmann Institute in 2012. Erez is a scientist and a physician; she recently opened a pediatric cancer genetics clinic at the Sheba Medical Center, the first of its kind in Israel.

"My mother attained a university education when it was a rarity for women to do so, and pursued a life dedicated to her family and the future of Israel"
Dr. Gil Omenn



Dr. Ayelet Erez

Previously, she was an assistant professor of molecular and human genetics at Baylor College of Medicine and a medical geneticist at Texas Children's Hospital. There, she investigated a rare inherited disorder called argininosuccinic aciduria (ASA), caused by a lack of the functional gene necessary to make an enzyme called argininosuccinate lyase. Without this enzyme, patients cannot make arginine, an amino acid that plays an important role in enabling the body to avoid a toxic buildup of ammonia, which can damage the body's organs and brain. She also discovered that the enzyme has an additional function regulating the production of nitric oxide, which is involved in virtually every process in the body.

In her new lab at the Weizmann Institute, Erez is exploring the relationship of various enzymes and processes to cancer. She hopes her research will shed light on the metabolic changes that are critical for tumor formation and progression, enabling the identification of novel therapeutic targets. Her findings also open new treatment avenues for multiple disorders involving nitric oxide dysregulation.

The choice of Dr. Erez as the first incumbent of the Omenn CDC, says Gil, reflects the family's commitment to nurturing the careers of women scientists, a major Weizmann Institute priority.

Members of the European mission to the Weizmann Institute

Mission Brings More than Two Dozen Participants to Weizmann Institute in May

The European Committee for the Weizmann Institute of Science hosted 28 Europeans on campus in May for a four-day program that emphasized Institute advancements in personalized medicine, brain research, environmental science and science education.

"What has come through loud and clear to me is how Weizmann Institute research is driven by curiosity, and how freedom to think and explore creates a successful research culture," said Prof. Jörg Menno Harms, Chairman of the supervisory board of Hewlett Packard GmbH. "Witnessing this first hand confirms to me that the Institute has the right approach to science, and the results are obvious."

Among the mission participants was Wendelin Zellmayer of Switzerland, CEO of the Rising Tide Foundation, which recently gave a major gift to support translational research initiatives. "We are big fans of Israel and of the Weizmann Institute, and for us it is important and exciting to see the investment in research in personalized medicine and the vast resources devoted to cancer research in particular," he said.

The group, which hailed from Germany, Switzerland, Belgium, Italy, Austria, Lichtenstein and Spain, heard presentations from a number of scientists, including Prof. Zvi Livneh, the Maxwell Ellis Professor of Biomedical Research and Dean of the Faculty of Biochemistry, on plans for the Israel National Center for Personalized Medicine; Dr. Ofer Yizhar, incumbent of the Gertrude and Philip Nollman Career Development Chair, on the promising field of optogenetics for the understanding of neural networks involved in health and disease; and Prof. Oded Aharonson on his investigations of the moon Titan. The mission also involved a day trip to Jerusalem and a tour of old Jaffa.

At a luncheon hosted by Prof. Yossi Nir, the Amos de-Shalit Professor of Theoretical Physics and Dean of the Faculty of Physics, and physicists Dr. Nirit Dudovich and Dr. Roee Ozeri spoke about their research and why they chose to establish their careers and laboratories at the Institute. Dudovich talked about developments in ultra-fast photography for the purpose of capturing biological processes in action, and Ozeri spoke about one of the greatest challenges in developing quantum computers: finding appropriate units, or qubits, for storing information, towards the development of the computers of the future.

Mission participant Janine Hermann, Head of Educationals at Interpharma, an association of research-based pharmaceutical companies in Switzerland, who also develops and produces teaching tools and games, said she was most interested in learning about the programs of the Davidson Institute of Science Education. "In Switzerland, science teachers need better tools and innovative programs so that their students are exposed to the latest developments of science," she says. "The Weizmann Institute offers a great model – a strong support system to the educational system, so that outstanding students can be stimulated and challenged, and so that a wide array of other students are exposed to things they may not be exposed to in their classrooms."

For Dr. Michaela Fritz of Austria, the mission represented her first trip to Israel. She was most intrigued, she said, by the inside look at Israeli innovation and entrepreneurship in the sciences. As Head of the Health and Environment Department at the AIT, Austrian Institute of Technology, her efforts are devoted to developing innovative technologies to improve human health and ecological sustainability.

"Visiting the Weizmann Institute was a wonderful experience of learning about what science can do for mankind and a better future. Apart from this, it is all about people, and the people we met at Weizmann are certainly special," says Edda Fels, Senior Vice President Corporate Communications at Axel Springer AG.

In May, a gala was held in New York to honor Prof. Michael and Sara Sela. In the photo: (l-r) Nadav Kaplan, Tamar, Irit and Prof. Michael Sela, Orly Sela Kaplan and Sara Sela

The Brazilian Connection

Philanthropists from South America's biggest country are backing alternative energy research in Israel and also promoting a biomedical research collaboration between the Weizmann Institute of Science and Brazilian scientists and physicians

Dr. Claudio Lottenberg, Einstein Medical Center President

(l-r) Institute President Prof. Daniel Zajfman, and Roberto Ruhman and his son Daniel at the Weizmann Institute

Brazil is an epicenter of global attention on environmental issues: It has had the highest deforestation rate in the world – which threatens the Amazon Basin and its biodiversity, and increases greenhouse gases. The country grapples with endangered species, illegal wildlife trade, air and water pollution, and land degradation related to mining. At the same time, it is a world leader in biofuels as a major producer of ethanol. With these topics at the forefront of the minds of many Brazilians, it was "a natural choice" for a group of Brazilian friends of the Weizmann Institute to launch a philanthropic initiative directing funds to alternative energy research at the Institute, says Mario Fleck, Chairman of the Brazilian Friends of the Weizmann Institute of Science and a resident of São Paolo.

"Brazil has been researching and developing alternative energy sources for many years," says Fleck. "When the suggestion of our participation in the Weizmann Institute's initiatives in this field was presented to us, it just seemed a perfect fit. We are very proud of the achievements of these first years and we look forward to further enhancement of the Brazil-Weizmann connection."

To this end, a group of nine Brazilian donors, including Fleck, created the Brazil-Israel Alternative Energy Research Fund in 2008, which goes to the Institute's Alternative and Sustainable Energy Research Initiative (AERI) and is earmarked for biofuels research projects.

In one project supported by the Fund, Prof. Ed Bayer, the Maynard I. and Elaine Wishner Professor of Bio-Organic Chemistry, is searching for ways to efficiently break down the cellulose in crop wastes into usable sugars to create alcohol-based fuels. In another project, Dr. Ron Milo, incumbent of the Anna and Maurice Boukstein Career Development Chair in Perpetuity, is exploring ways to increase the efficiency of carbon fixation (the biological process that converts CO_2 into organic compounds), which would contribute to biofuel production. The Fund has also supported Prof. Avi Levy, the Gilbert de Botton Professor of Plant Sciences, in his discovery of wheat strains with highly digestible straw that could serve as feedstock for biofuel production.

Brainy partnerships

Brazilian Friends' support is also making a difference in another research direction in recent years. The generous gifts of Roberto and Renata Ruhman of São Paolo have enabled the development of an extraordinary collaboration between the Weizmann Institute, the Albert Einstein Medical Center in São Paulo and the University of São Paulo, bringing together scientists and physicians who are investigating Alzheimer's disease, amoebic dysentery and improved techniques for stem cell therapy.

"The combination of the strengths of the Weizmann Institute and Albert Einstein Hospital may be unique, and these can also be leveraged by building a new, positive agenda in interfaces and cooperation between Brazil and Israel," says Ruhman, whose initiative launched the collaboration. "Hopefully these are the first steps toward a high-level, long-term relationship that could be inspiring in many fields besides science." A donor and board member of the Weizmann Institute, Ruhman is also a long-time board member of Einstein Medical Center, which was established by the Jewish community of São Paulo in the 1950s.

The three-way partnership gives Weizmann Institute researchers new clinical partners in South America and builds bridges of scientific cooperation between Israel and Brazil.

Two teams of Weizmann Institute scientists have so far visited colleagues in Brazil – in 2010 and 2012 – and seven Brazilian scientists gave lectures and workshops at the Weizmann Institute in 2013. Several labs have exchanged students, and the relationship continues to grow.

The Einstein Medical Center has one of the biggest "brain banks" in the world – a repository of brain tissue, genetic information and medical histories of deceased individuals. Dr. David Schlesinger and his group at Einstein are drawing on this invaluable resource to conduct whole-genome studies in human patients and find genes important for the progression of Alzheimer's and other diseases. This work has led to a collaboration with Dr. Maya Schuldiner's lab in the Weizmann Institute's Molecular Genetics Department; Schuldiner uses high-throughput and systematic approaches to characterize protein functions in the cell. Working together, they are helping uncover how a specific protein can cause disease. By combining Schlesinger's findings in humans with Schuldiner's findings in yeast, the Einstein-Weizmann collaboration is attaining novel insights into this devastating disease.

Says Schuldiner: "The collaboration of a basic science research institute such as Weizmann with an institute that is focused on applied human therapy, such as the Einstein Medical Center, has enabled us to create a unique blend of science. Led by Dr. Schlesinger's group, we have been able to go all the way from the patients to characterizing new disease variants, finding the mutated disease gene and understanding the basic cell biology behind its malfunction. This is really the 'holy grail' of translational research, and we could not have done it without this collaboration."

Leukemia is the focus of a second collaboration – between the Weizmann

Institute's Prof. Yair Reisner, the Henry H. Drake Professor of Immunology, and Dr. Andreza Alice Feitosa Ribeiro at Einstein Hospital. They are working together to improve stem cell replacement therapy for leukemia patients without a genetically matching donor, in order to minimize rejection. This is especially important for elderly patients who cannot tolerate intensive radiation or chemotherapy, as well as for other disorders. "Our shared goal is to streamline the bench-to-bedside process for new cell therapy and organ transplantation techniques, and to share perspectives between clinicians and basic researchers," says Reisner.

Prof. Dov Zipori, the Joe and Celia Weinstein Professor, is working with Einstein's Dr. Anna Carla Goldberg to set up a mesenchymal stem cell technology transfer and core facility for Einstein researchers. Zipori specializes in research on mesenchymal stromal progenitor cells (MSCs), which are an attractive cell-based therapy tool for developmental defects, degenerating diseases and tissue injuries.

Prof. David Mirelman is working with two Brazilian scientists on a genetically modified parasite that causes amoebic dysentery. The genetic modification rendered the parasite harmless; thus it could serve as a vaccine against the illness, which is common in many developing countries. For instance, in the Amazon Basin in the north of Brazil, the disease is prevalent because potable water is often polluted by sewage. And Prof. Rony Seger, the Yale S. Lewine and Ella Miller Lewine Professor for Cancer Research, is working with a Brazilian counterpart on the effect of UV radiation on cellular signaling.

For Einstein Medical Center, a research hospital where scientists regularly interact with physicians, the connection to the Weizmann Institute is "natural," says Dr. Claudio Lottenberg, President of Einstein Medical Center, who visited the Weizmann Institute in May to explore new opportunities for collaboration – this time in personalized medicine. "I'm very proud of the connection to the Weizmann Institute both personally as a Jew, because it strengthens my connection to Israel, and professionally – because the Institute is one of the world's leaders in scientific research."

(l-r) British Ambassador to Israel Matthew Gould and Israel's President Shimon Peres raise a glass to Queen Elizabeth II during a celebration in honor of her 87th birthday, held at Weizmann House and hosted by the British Council

(l-r) Sir David Sieff, Sara and Prof. Michael Sela, and Larry Blumberg in 1982

Q&A with Larry Blumberg

Lawrence S. Blumberg has served as Chairman of the American Committee for the Weizmann Institute of Science (ACWIS) for the past six years. Larry, 66, is a New York attorney. He has represented many of the donors and estates that have provided significant support to the Weizmann Institute.

Larry has served in multiple leadership positions on the Weizmann International and Executive Boards since his first election in 1984 to its Board of Governors. The Blumberg family is a major source of support to the Institute, and Larry and his wife, Robin Lynn, are charter members of the President's Circle. In recognition of his decades of work for and commitment to the Weizmann Institute mission, in 2001 the Institute awarded Larry a Ph.D *honoris causa*.

In his more than three decades of service, Larry has served in numerous senior leadership positions in ACWIS, including secretary, vice president and general counsel, chair of the New York Region, and head of the Planned Giving Committee. He was elected Chairman of the American Committee in late 2007. Larry concludes his term as chairman in October, when he will be succeeded by longtime Institute supporter Ellen Merlo.

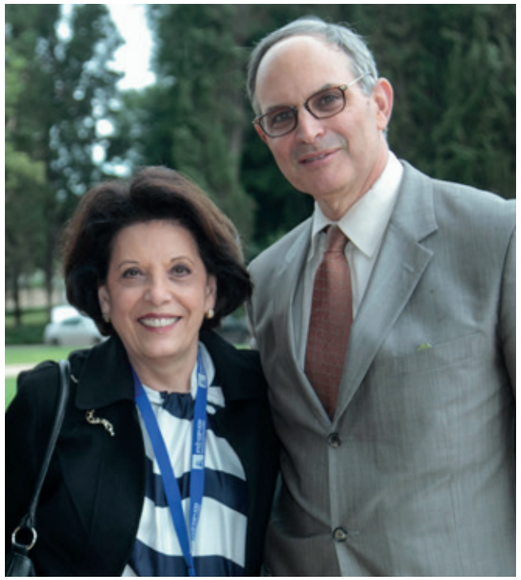
How did you first become involved with ACWIS?

"My parents, Rhoda and Gerald, were involved, and they encouraged my involvement. My father, also an attorney, had steered a substantial bequest to the Institute in 1973 to establish the Harold L. Korda Chair in Cancer Research. My father joined the ACWIS board, where he assisted the organization in establishing a planned giving program. I graduated from law school in 1973 and attended my first ACWIS event in 1976, shortly before I joined my father in practicing law.

Do you recall your first visit to the Institute?

"In 1981, I joined the Impact of Science Symposium – a week at the Institute for lay people. It transformed my life. After five days of scientific lectures, visits to high-tech companies, and meetings with Israeli political and social leaders, we were all exhausted but exhilarated. I was enthralled by the concept of basic science, of supporting brilliant people to follow their curiosity. I returned home knowing that this is where I wanted to spend my time. ACWIS embraced me, at age 34, as one of its youngest leaders.

I was then elected to the Institute's Board of Governors and its Executive Committee and began to travel to Israel each November and May for the next 30



Incoming ACWIS Chair Ellen Merlo and Larry Blumberg

years. I have made many friends among the Institute's scientists and developed other friendships that tie me to Israel.

What have been your biggest achievements and challenges over the years?

"I have been involved, in one way or another, in almost all the most significant gifts from ACWIS donors, mostly estates. It has been a privilege to witness people's generosity and how they wish to be remembered, and to help them achieve their goals.

In the mid-1980s I helped ACWIS in its efforts to attain a more sound financial footing for the Institute, and I was very proud of the role I played.

I became ACWIS chairman during a very challenging time in 2007, during the height of the financial crisis and recession in the US. The Madoff fraud that followed a year later threw the world of Jewish philanthropy into shock and turmoil. Fortunately, the Institute was well insulated from the scandal. It was a challenging time to be chairman, but the skills I learned then have served me well.

Now, one of the things I am focused on is better engaging a new generation of leaders.

What will motivate the next generation to continue to care about the Weizmann Institute and Israel?

"My generation was strongly moved by the founding of Israel after the Holocaust, the War of Independence and the Six Day War, and especially by Israel's ideals. Things are more complicated now, with fewer Americans visiting Israel and more diverse outlets for philanthropy. Visiting Israel and making personal connections is so important, and programs like Birthright Israel are effective and should be encouraged.

The Weizmann Institute has something special that many others don't have: It is one of the world's great scientific institutions – and it's in Israel. Our work benefits humanity; it just happens to be done by Israelis in Israel. One of the models of the ACWIS donor is what we call a "Jewish maverick" – a person who is not actively connected to the Jewish institutional structure or Israeli politics. For this person, the Institute's goal of science for the benefit of humanity and support for Israel is a perfect mix.

What is the Weizmann Institute to you?

"So much. Of course it is a great scientific institution, but is has also become a home. I have made so many friends among its scientists and staff. My many trips to Institute meetings have connected me to Israel in so many ways. The Weizmann Institute is one of the most important things in my life, and I look forward to many decades of further involvement."

Larry Blumberg

Beating Biofilms

For better or worse, bacteria that live communally gain extra protection. Dr. Ilana Kolodkin-Gal investigates

Setting up a new lab while raising a young child is challenging, but Dr. Ilana Kolodkin-Gal says the pressure is well worth it: "Biology is my third greatest love, after my husband and my son." After giving birth to Yuval two years ago, in the midst of her postdoctoral studies at Harvard University, she didn't cut down on work, only redistributed it: Since she could no longer stay in the lab till 9 pm, she made up for that by working through the weekend. Today, when her schedule is even more intense, she finds the time to write grant proposals and read books after 11:30 pm.

Kolodkin-Gal earned her Ph.D. in microbiology *summa cum laude* from the Hebrew University of Jerusalem in 2009. That same year, she received an award from the Weizmann Institute's National Postdoctoral Program for Advancing Women in Science, for which she is exceptionally grateful: It enabled her husband, Dr. Dror Kolodkin-Gal (both had adopted the hyphenated name when they married) to accompany her to Boston. Ilana joined the Weizmann Institute faculty in 2011; Dror conducts research in virology and cancer at the Hadassah Medical Center in Jerusalem.

As a student, Kolodkin-Gal became interested in biofilms: giant communities of bacteria that thrive in a variety of situations. Their inhabitants, shielded by a matrix, are much better protected against environmental insults than free-living bacteria. Knowing how to break up biofilms or, conversely, how to keep them together can be of immense practical importance. Biofilms, for instance, tend to form on artificial heart valves, catheters, joint prostheses and virtually all other prosthetic devices implanted into the human body. Those that form on the wounds of people with diabetes or in the lungs of cystic fibrosis patients are particularly dangerous. Treatment of these infections is particularly challenging because biofilms grant bacteria resistance to many antibiotics, but the nature of this resistance is still poorly understood.

Biofilms grant bacteria resistance to many antibiotics, but the nature of this resistance is still poorly understood

On the other hand, biofilms that coat plant roots can be exceptionally beneficial, protecting the roots against pest invasions.

During her postdoctoral studies at Harvard, Kolodkin-Gal began to study the natural breakup of biofilms that sometimes occurs when they become too thick to let in nutrients and accumulate too much bacterial waste. She managed to identify small molecules called D-amino acids that are released by bacteria to dissolve biofilms. Her studies suggest that these and other biofilm-dissolving molecules she discovered can be manipulated to break down existing biofilms as well as prevent their formation.

In her new Weizmann Institute lab, Kolodkin-Gal carries these studies further. She intends to clarify, for instance, how their internal scaffolding holds the biofilms together, as well as investigate structural changes in the bacteria's outer envelopes that affect their behavior within the biofilm community. Among the biofilms that are medically relevant, Kolodkin-Gal is particularly interested in those formed by *Staphylococcus*, a bacterium commonly involved in infectious diseases.

Kolodkin-Gal also conducts studies on beneficial bacteria that might lead to ways of enhancing their communal organization – for example, to provide better protection for plant roots and reduce the need for chemical pesticides in agriculture. In yet another environmentally relevant project, new ideas for dealing with carbon dioxide, thought to be a major contributor to global warming, might be gleaned from biofilms that convert this gas into mineral deposits.

Dr. Ilana Kolodkin-Gal

Solving the Sign Problem

Theoretical physicist Dr. Erez Berg's research is leading to better models of high-temperature superconductivity

Growing up in Haifa, Dr. Erez Berg says he first learned about physics from his father, an electrical engineer. By the time he finished high school, Berg was already on his way to a promising career in the field, taking a silver medal in that year's International Physics Olympiad. He joined a prestigious army/study program, serving in the Theoretical Physics Division of Rafael, Israel's Armament Development Authority, while earning his B.Sc. and M.Sc. from the Technion – Israel Institute of Technology. Berg continued on to Ph.D. studies in theoretical condensed matter physics at Stanford University and a postdoctoral fellowship at Harvard University, where his research subjects included high-temperature superconductors, strongly correlated materials and the topological properties of matter. Berg joined the Weizmann Institute's Faculty of Physics in 2012; he lives on campus with his wife, Bar.

Berg's recent research concerns a phenomenon that was discovered over 100 years ago but remains mysterious even today: superconductivity. In a superconductor, all resistance to the passage of electric current disappears. Clearly such materials would be highly useful: Electricity flowing through superconducting wires could travel long distances without energy loss, electrical devices that don't heat up could be devised and more. The only catch is that superconductors mostly exist at the lowest reaches of the temperature scale – just a few degrees above absolute zero (-273°C).

The discovery in the 1980s of high-temperature superconductors, mainly exotic ceramic compounds that gain superconductive properties at somewhat warmer temperatures (up to -137°C), provided a ray of hope that the ultimate goal – room temperature superconductors – might be achievable. But these new materials soon presented physicists with a new set of puzzles. In low-temperature superconductors, the electrons manage to overcome their natural repulsion for one another and travel in pairs. But in the high-temperature materials, another phenomenon also takes place: The spins of their particles take on a new configuration such that the total of all the spins averages around zero. This phenomenon is seen close to the appearance of electron pairing: A small change in conditions can send the material from this state to one of superconductivity and vice versa, though the connection between the two states is not understood.

Berg's recent research concerns a phenomenon that was discovered over 100 years ago but remains mysterious even today

Berg recently found a solution to a problem that has plagued efforts to model the transition to the new spin state. To work out the probability of a particular physical process occurring – for example, the movement of a particle between two points – physicists take the sum of all paths through which the process can take place. But when the process involves many particles, as in the movement of all the electrons in a material, the number of possible paths becomes too large to calculate. Thus, researchers have come up with a way of estimating the probability, dubbed the Monte Carlo method because it is based on a random lottery of a small number of representative paths. The problem is that, when the total is around zero, the final result might be either positive or negative. That switch in signs (called the sign problem) turns a small error in estimation into a much larger possible error in prediction.

Berg found a way to avoid the sign problem in the Monte Carlo method – one that ensures a positive total. Computerized experiments using the model seem to give results that fit well with observed reality, and Berg hopes that this will lead to lab experiments that will test the model in the near future.

Dr. Erez Berg

Newly Hired Scientists

include alumnae of overseas postdoc award program for women

Among the approximately one dozen new scientists who will join the Weizmann Institute's faculty in 2013-2014, three are women – all three of whom were recipients of the Weizmann Institute's National Postdoctoral Award for Advancing Women in Science.

This nationwide program was founded at the Institute in 2007 to address the need to increase the number of women who choose science as a career and the percentage of women in top academic faculty positions. The program is meant to help young women through the main bottleneck that prevents many of them from continuing on to academic positions in Israel: the need to conduct postdoctoral research in the world's leading labs in the US and Europe.

By the time they have completed their Ph.D.s, many women have young families, and the expense of moving the entire family abroad for several years can be prohibitive. Each year, the Weizmann Institute gives special awards to 10 outstanding young women who have completed their doctorates in the natural or exact sciences in one of Israel's academic institutions and have been accepted to a postdoctoral position abroad. The program is headed by the Weizmann Institute's Adviser to the President for Advancing Women in Science, Prof. Varda Rotter.

Our New Women Scientists

Dr. Karen Michaeli is joining the Condensed Matter Physics Department, where she completed her Ph.D. In the interim, she has been a Pappalardo Postdoctoral Fellow in the Physics Department at the Massachusetts Institute of Technology. Her research focuses on electron correlations, which lie at the heart of quantum condensed matter physics. Interactions between electrons can drive transitions into a plethora of new phases, ranging from magnets to superconductors. Michaeli is particularly interested in exploring the novel phases arising from strong interactions and the signatures of the corresponding unconventional quasiparticles in electron transport and other measurements.

Dr. Karen Michaeli

Dr. Michal Rivlin

Dr. Michal Rivlin completed her Ph.D. in the Interdisciplinary Center for Neural Computation at the Hebrew University of Jerusalem and was a postdoctoral fellow in the Molecular and Cell Biology Department and the Helen Wills Neuroscience Institute at the University of California, Berkeley. She is joining the Neurobiology Department. Rivlin studies the retina of the eye and its relation to neuronal circuitry. The retina has a simple layered structure and yet it performs complex computations on the visual field. She has studied the direction-selective retinal ganglion cells that encode motion and her findings represent a paradigm shift in our understanding of retinal circuits as well as of the entire visual pathway.

Dr. Noam Stern-Ginossar, who is joining the Molecular Genetics Department, received her Ph.D. in Immunology at the Hebrew University of Jerusalem and continued her postdoctoral studies at the University of California, San Francisco, in its Cellular and Molecular Pharmacology Department. There, she used a combination of techniques to study the complete set of expressed proteins of the human cytomegalovirus (HCMV). This deeper look at HCMV provides the first steps toward understanding how this virus and others hijack human cells during infection. At the Weizmann Institute, Stern-Ginossar will continue to delve into the study of viruses in order to decode the processes which occur during viral infection that have so far been overlooked, with the potential of revealing fundamental cellular principles.

Dr. Noam Stern-Ginossar

Dr. Karina Yaniv (right) accepts the Capmany Award from a representative of the Barcelona city council

Maria Aurèlia Capmany Award to the Weizmann Institute

On International Women's Day, March 4, the Weizmann Institute of Science received an award from the city of Barcelona for its commitment to advancing young women in science. Dr. Karina Yaniv, incumbent of the Louis and Ida Rich Career Development Chair, a successful woman scientist and native Spanish speaker, accepted the award in the name of the Institute in Barcelona city hall from members of the city council's section for Women and Civil Rights.

The 27th Maria Aurèlia Capmany Award was given to the Institute for its National Postdoctoral Award for Advancing Women in Science. Supported by the Charles H. Revson Foundation in New York, the Clore Israel Foundation and additional philanthropic sources, this program gives young women additional grants, on top of fellowships they have already received, to move their families abroad so they can conduct postdoctoral research in leading labs around the world. Since the program was founded at the Institute in 2007, 64 women have received these awards, and the benefits to Israeli science are already being felt. As of March, 17 of the young women had already completed their postdoctoral research and returned to academic positions in Israel.

Prof. Yardena Samuels

Gruber Award to Cancer Geneticist Prof. Yardena Samuels

Prof. Yardena Samuels, the Knell Family Professor, is the 2013 recipient of the Peter and Patricia Gruber Award for Scientific Excellence, funded by Patricia and Peter Gruber of St. Thomas in the US Virgin Islands. The award funds the work of promising young scientists for a period of three years. Supported by the Peter and Patricia Gruber Foundation and part of the Foundation's International Young Scientists Award, the award has enabled seven rising talents from the Weizmann Institute, including Samuels, to develop research in a variety of fields, including neurobiology, particle physics, astrophysics and organic chemistry.

A three-way videoconference ceremony between the University of the US Virgin Islands in St. Thomas, the Weizmann Institute and Belgium was held on April 23, 2013; Prof. Israel Bar-Joseph, Weizmann Institute Vice President for Resource Development and Public Affairs, participated in the ceremony with Samuels, and Patricia Gruber and her guests.

Samuels uses the power of DNA sequencing to identify new groups of genetic mutations involved in the deadliest form of skin cancer: melanoma. One of her discoveries, a mutation found in nearly one-fifth of all melanoma cases, was particularly encouraging because it is located in a gene already targeted by a drug approved for certain types of breast cancer, and preliminary clinical trials are under way. Her studies provide the kind of data required for truly personalized cancer therapy.

At the award ceremony, Samuels thanked the Grubers for what she considered a great honor, explaining that, "the award will help me greatly in establishing my new lab at the Weizmann Institute."

Dr. Zohar Komargodski, the sixth Gruber Award recipient, in 2012, recently received one of the highest honors given today to young investigators: the New Horizons in Physics Prize. That honor indicates that "we are probably selecting the right candidates for the Gruber Award," remarked Israel Bar-Joseph, "We will hear more about the current recipient in the coming years, too. Prof. Yardena Samuels is part of a revolution, and her arrival at the Weizmann Institute is generating it. One of the most profound decisions we have taken lately is to establish the Israel National Center for Personalized Medicine. She is the perfect example of a researcher that would make use of the Center, and we were thrilled that she accepted our offer to join our ranks, leaving a very comfortable position in the National Institutes of Health (NIH), which is at the center of everything that happens in this area."

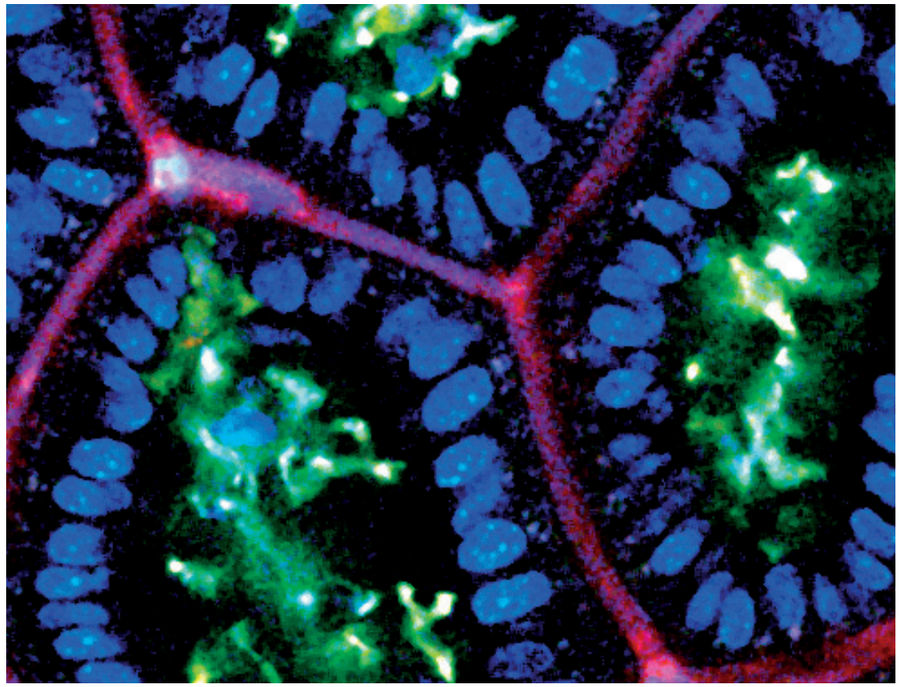
Samuels received her B.Sc. from Newnham College at Cambridge University, UK, in 1993, and earned an M.Sc. in Immunology and Cancer Research at the Hebrew University of Jerusalem, Hadassah Medical School, in 1997. She completed a Ph.D. in Molecular Cancer Biology at the Ludwig Institute for Cancer Research, Imperial College, London, in 2002. Samuels worked as a postdoctoral fellow at Johns Hopkins University School of Medicine from 2003 to 2006. She served as an assistant professor and independent investigator with the Cancer Genetics Branch of the (US) National Human Genome Research Institute at the NIH.

During the Gruber Award ceremony, Patricia Gruber noted that, "It is hard to believe that 10 years have passed since we started our association with the Weizmann Institute, but we could not be more proud to be associated with all the cutting-edge work."

Science on Tap

A unique event in which Weizmann Institute scientists go to bars, coffee shops and restaurants in Tel Aviv to talk about their subjects was bigger and better than ever this year. The event took place midweek at the end of April in 61 different venues in the city and, as always, they were filled to capacity. Some of this year's attendees got an added dollop of culture: Several poets and writers who deal with science-related topics read from their work during the evening. In the photo: Anat Arzi, a student in the neurobiology group of Prof. Noam Sobel, describes her findings on a unique type of sleep learning in which volunteers learned to associate smells with sounds.

Immune System Science

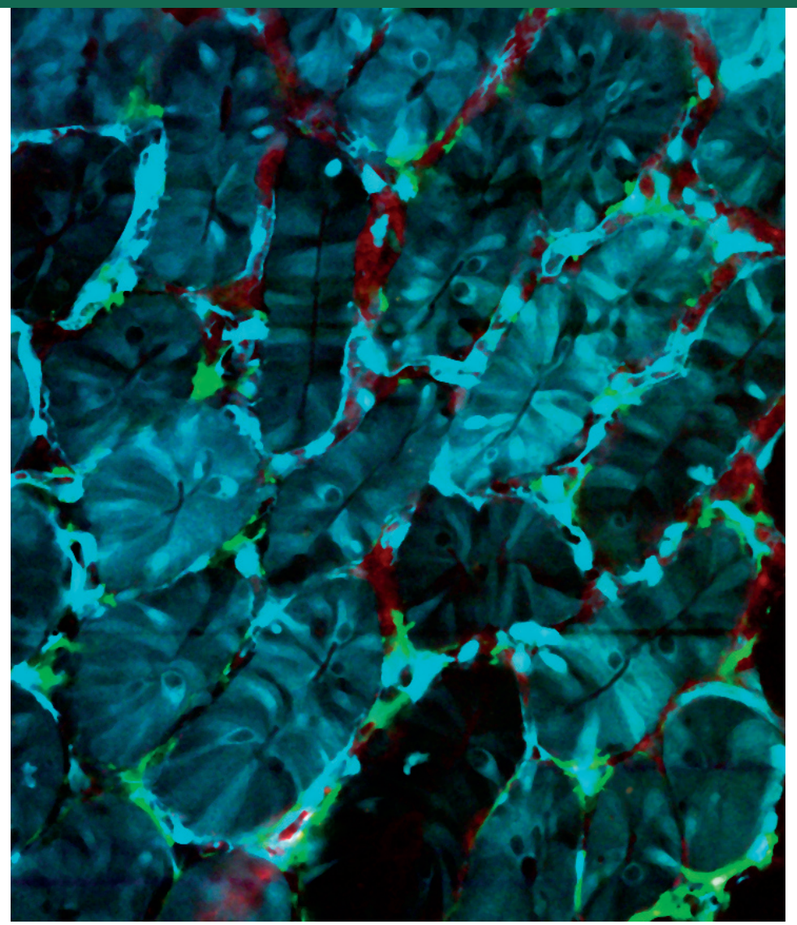


Epithelial cells (blue) in the lining of the small intestine. Dendritic cells (green) reach between them to grab pathogens. From the lab of Dr. Guy Shakhar

The complexity of the human immune system is rivaled only by that of our brains. While its enemies – pathogenic bacteria, viruses and fungi – manage by mutating and evolving rapidly, such longer-lived organisms as humans have had to evolve a system that is stable, yet highly adaptable; selective, yet able to respond to a broad range of threats; fast-acting, yet long-lasting. So it is no surprise that, for all of its wonders, our immune system seems to be constantly under construction. There are failures – spectacular ones like HIV, in which the virus hides out in immune cells – as well as such relatively common ones as new flu strains that can sweep through populations before immune systems kick in. And then there are autoimmune diseases, in which immune cells attack the body's own tissues; these are estimated to affect up to 12% of the population – more than heart disease or cancer. Our immune system also plays a role in cancer – both in aiding cancer growth and in preventing its progression. And recent research has been turning up some surprising new roles for the immune system. For example, a study in the lab of the Weizmann Institute's Prof. Steffen Jung revealed that a type of immune cell called a dendritic cell, more often known to patrol the body looking for potential threats, congregates in the uterus to help prepare the "nursery" for a new embryo.

Weizmann Institute research involves many different aspects of the immune system. Treatments for autoimmune diseases, including Copaxone® and Rebif® for multiple sclerosis, as well as Diapep277®, in clinical trials for type 1 diabetes, are just some of the applications to arise from Institute labs. Other research explores ways of using the immune system to fight cancer, how white blood cells get to infection sites and the genetics of the immune system, among other things. The following is a mere sample of recent immune system-related research at the Institute.

Profs. Yair Reisner and Idit Shachar



Two-photon microscope image of dendritic cells (green) around blood vessels (red) in the wall of the large intestine (blue). From the lab of Dr. Guy Shakhar

Convincing Cancer Cells to Die

Long life is not always a blessing, at least in the case of certain lymphocytes – white blood cells. When these normally short-lived cells refuse to die – in such cancer as chronic lymphocytic leukemia (CLL) – they accumulate in small blood vessels, lymph nodes and bone marrow. This common form of leukemia is mostly incurable, and the treatments often have serious side effects.

Prof. Idit Shachar, the Dr. Morton and Anne Kleiman Professor, wants to know how the disease-causing cells manage to stay alive. She and her group had discovered that a protein on the cell membrane, CD74, can be activated by messengers outside the cell, setting off a chain of events that promotes survival. In CLL, CD74 is produced and expressed in excess on the cells' surface. In a recent study, they investigated a link in that chain – a protein called CD84.

CD84, like CD74, is highly overproduced in cancer and, because it is also found on the cell's outer surface, the researchers thought that it might present a good target for treatment. Working with malignant cells from CLL patients, Shachar and her team, along with physicians from Kaplan Medical Center, created antibodies against CD84 and added them to the cell cultures. The cancer cells died. Shachar and her team are continuing to investigate the actions of CD84 to understand exactly how blocking it can shorten the cells' lifespan, but they believe that future treatments which specifically target this protein might be better at killing the cancerous cells and cause fewer side effects than today's chemotherapy.

(l-r) Dr. Guy Shakhar and Prof. Steffen Jung

Gut reaction

One of the more fascinating revelations of recent years has to do with the makeup of our gut microbiota – the billions of bacteria that reside in the intestines of each and every one of us. These bacterial communities, which add around two kilos to our weight, are vital to maintaining our health – helping us digest our food and train our immune system, among other things. Scientists are just beginning to understand the ways in which our microbiota and our immune systems communicate. There are some indications, for example, that inflammatory bowel disease, an autoinflammatory disorder, might be tied to upsets in the microbiota balance or to problems in the crosstalk between the bacteria and the immune system. Two Institute immunologists – Prof. Steffen Jung and Dr. Guy Shakhar – have been working together to uncover the details of the relationship.

Research led by Jung's lab has focused on immune cells, called macrophages (literally, big eaters), which help keep our insides clean and healthy by clearing up debris – used cells, dead bacteria, etc. Rather than arriving in the gut fully formed, macrophages are released from the blood in a precursor form called monocytes. Among other things, to become a full-fledged macrophage, a monocyte must receive training within the context of the gut. The team's findings suggest that if newly arrived monocytes stumble upon a scene of gut inflammation – from an infection, for example – their education can be disrupted. If, as a result, they receive the wrong lesson, they can end up promoting inflammation, even after the infection has cleared, rather than preventing it.

The gut microbiota forms a sort of bacterial ecosystem that generally exists in harmony with the immune system. How does the immune system differentiate between these and harmful bacteria, for example *Salmonella*, which even in low numbers can infiltrate the peaceful gut community and cause disease? Using a two-photon microscope that enabled them to observe goings-on in the gut lining in real time, Shakhar and his team watched as *Salmonella* bacteria entered a mouse's small intestine. The *Salmonella* latched on to the cells lining the gut – something that normal gut bacteria don't seem to do – prompting the intestinal cells to send a message to the immune system. Within half an

hour, spiny dendritic cells could be seen squeezing their way through the upper layers of the gut lining and grabbing the bacteria, which they then hauled off to the lymph nodes – the immune system headquarters for assessing a threat and launching an all-out attack on invading pathogens.

By fitting together various pieces of the inflammatory process in the gut, the researchers hope to be able to suggest ways of preventing flare-ups of inflammatory bowel disease, a problem that affects millions and for which there is no cure and little effective treatment, today.

Tolerance for donor immune cells

Bone marrow transplants can involve a clash between two immune systems: that of the donor and that of the recipient. Even when the match between the two is good, recipients must often take drugs that strongly suppress the immune system to prevent rejection of the transplanted cells. And, occasionally, graft-versus-host disease can develop, in which the foreign immune cells attack the recipient's own immune system.

Research in the lab of Prof. Yair Reisner, the Henry H. Drake Professor of Immunology, may be pointing the way toward an end to the hostilities. In addition to making bone marrow transplants safer, methods based on his research could make the procedure available to those suffering from such debilitating but non-fatal disorders as sickle-cell anemia, as well as elderly people who are too frail to endure massive immune suppression.

The research involves immune cells known as veto cells. These cells are highly toxic to the host's immune cells, killing them with ready-made poisons before the host cells have a chance to fight back. Reisner and his team succeeded in creating veto cells that are less toxic than normal, but still manage to preemptively eliminate those immune cells in the host that are meant to reject them. Further experimentation enabled the researchers to equip the veto cells with a navigation system that directed them to the lymph nodes, where they could exert a protective effect. When the scientists grafted skin from black mice onto white mice, along with a dose of the improved veto cells, the white mice tolerated the grafts well, with just mild suppression of their immune systems.

Within half an hour, spiny dendritic cells could be seen squeezing their way through the upper layers of the gut lining and grabbing the bacteria

Resisting HIV

HIV, the virus that causes AIDS, manages to infiltrate the very immune cells that are meant to fight infection. It can hide out in these cells for years without being detected by the immune system.

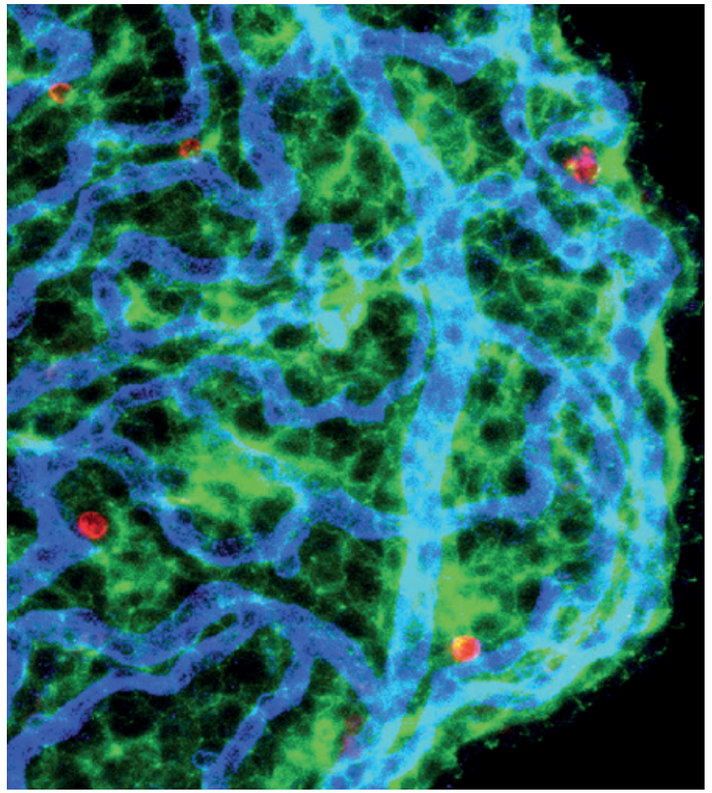
In recent years, research groups around the world have been investigating the immune systems of the lucky few who test positive for the virus but do not develop AIDS, hoping to learn the secret of their resistance. In his postdoctoral work at the California Institute of Technology, Dr. Ron Diskin, incumbent of the Tauro Career Development Chair in Biomedical Research, a crystallographer who recently joined the Weizmann Institute faculty, and his colleagues solved a crucial piece of this puzzle. They investigated why the antibodies these people developed to the virus carried many more mutations than a normal antibody, some of them in unexpected sites on their structures. While most antibodies sport mutations in the sites that actually make contact with the pathogen, these antibodies also bore changes in sites that impart structural support. In experiments, these mutations proved essential to the antibodies' efficiency. Since HIV is, itself, a master of mutation, the antibody mutations could be a sort of "fighting fire with fire" strategy that enables them to attack a broad range of virus structures.

In his Weizmann lab, Diskin, among other things, intends to attempt reveal the structure of a triple protein complex on the HIV envelop that enables it to infect immune cells. While parts of the single-protein structure have been solved, researchers have not yet obtained a detailed enough picture of the entire complex to understand exactly how it works, or how it might be blocked.

Saving Stem Cells

Members of the macrophage family – the same types of immune cells that clean up debris around our bodies and kill invading bacteria – were recently discovered carrying out a different task altogether. A rare sub-population of macrophages actually puts a damper on immune system activity by holding back some of the stem cells in the bone marrow from differentiating into blood immune cells. In cases of infection, for instance, when a call goes out to the bone marrow for extra immune cells, these macrophages take some of the stem cells under their wing and physically prevent their differentiation, thus ensuring a viable reservoir of stem cells to supply blood and immune cells for the next time.

Prof. Tsvee Lapidot, the Edith Arnoff Stein Professor in Stem Cell Research, and his student Dr. Aya Ludin led a team that revealed exactly how these macrophages prevent stem cell differentiation. On the one hand, their research provides an explanation for why certain stem cells often survive chemotherapy and, on the other, it has led to insight that may improve the efficiency of a leukemia treatment based on stem cells extracted from umbilical cord blood.



In the choroid plexus: T lymphocytes (red) in the stroma (green), outside the endothelial capillaries (blue). From the lab of Prof. Michal Schwartz

Immunity in the brain

Our brain and central nervous system (CNS) have extra layers of shielding that separate them from the rest of the body. This so-called blood-brain barrier keeps out many pathogens, as well as other substances, including many drugs. For years, it was thought that this barrier should always block the entry of immune system cells.

For over a decade, Prof. Michal Schwartz, the Maurice and Ilse Katz Professor of Neuroimmunology, and her team have been overturning that assumption, showing that certain immune cells not only act on the brain and CNS, but may be essential for the upkeep of certain functions, including learning and memory. Her most recent research has shown exactly how healing immune cells get directed to injury sites in the CNS, while a parallel study in her lab has shown that the brain, like the rest of the body, is susceptible to the problems of an aging immune system.

Schwartz and her team, including her student Kuti Baruch, and in collaboration with Dr. Nir Friedman, incumbent of the Pauline Recanati Career Development Chair, found that a unique store of immune cells is maintained within structures in the brain called the choroid plexi. These structures, with their fingerlike extensions that reach into the brain, are middlemen in the exchange of nutrients and waste products between the brain's cerebrospinal fluid and the blood. Although the choroid plexi present another barrier – the cerebrospinal-fluid barrier – Schwartz and her team found that this barrier was more of a gateway, guarded by the specialized immune cells. When the CNS is injured, healing immune cells can travel to the injury site through the choroid plexi, rather than having to cross the blood-brain barrier.

They also found that, over time, the choroid plexi's immune cells can undergo subtle shifts, similar to those seen in the rest of the immune system as it ages. These changes can lead to inflammation of the barrier, something Schwartz calls "rusty brain syndrome." Because this malfunction bears a resemblance to certain other immune system diseases of filters, for example, asthma in the lungs, she believes it will be possible, in the future, to develop methods of treating or preventing age-related memory loss.

At Home with Science and Math

Two innovative science teaching programs bring physics and math professional development to teachers' doorsteps, thanks to funding from the Trump Foundation of Israel

Israeli math teachers have taken a page from the playbook of professional sports – the video playback analysis.

In a new program, researchers from the Institute's Science Teaching Department are filming math lessons all over Israel. The footage then becomes a platform for reflective discussions with teachers that aim to raise the quality of math teaching.

The program, named VIDEO-LM (Viewing, Investigating and Discussing Environments of Learning Mathematics), aims at raising teachers' awareness of their teaching practices and decisions, prior to and during lessons. The program is "unique in both Israeli and international terms," says Dr. Ronnie Karsenty, who heads the program with Prof. Abraham Arcavi of that department.

The duo leads a team that consists of experienced math teachers who edit, transcribe and analyze these lessons, as well as others from abroad. In the current pilot year, they have also established a forum of lead teachers who meet regularly to watch and analyze filmed lesson footage together, not unlike a football team and coach going through a play-by-play retrospective. In this way the teachers sharpen mathematical ideas, discuss the lesson's goals and arising dilemmas, reflect on reactions to students' answers and learn from one another. The program is funded by the Trump Foundation, which is based in Israel and focuses on advancing science and math education in Israeli schools.

These master teachers are expected to lead similar sessions with their colleagues. In this way, they hope to create a trickle-down effect in which a wide peer network of math teachers will continue developing their skills. The footage will be available online, ultimately forming a searchable web-based film bank accessible to teachers from anywhere, says Arcavi. The repository will serve multiple purposes, from providing ideas on how to approach a problematic topic, to enabling teachers from geographically distant locations to participate in a professional community of teachers, to enabling teachers to capitalize on the experiences of their colleagues.

Teachers meet regularly to watch and analyze filmed lesson footage together, not unlike a football team and coach going through a play-by-play retrospective

Although math video clubs are prevalent in the US, their focus is typically on student thinking rather than on teaching practices, says Karsenty. American teachers who were recently exposed to the project found this approach refreshing and constructive, she adds.

The Weizmann Institute's Science Teaching Department is a national leader in math and science education, conducting cutting-edge research on instruction and learning in the sciences; generating fresh learning, teaching and assessment materials geared toward enhancing student learning and motivation; and offering professional development for teachers.

A second new program offers advanced training for physics teachers close to home, in a regional instruction format that aims to foster teacher communities. "Physics is a particularly challenging high school subject, demanding high-quality instruction and typically attracting only the most talented students. The field is rapidly developing, and teachers must keep up with those developments as well as developments in the teaching of the subject," says Prof. Bat Sheva Eylon, Head of the Science Teaching Department. She directs the Physics Teachers' Professional Learning Communities program with Dr. Esther Bagno.

Physics teachers at an end-of-year get-together at the Clore Garden of Science

The program, also funded by the Trump Foundation, aims to "cultivate high-quality, creative and appealing teaching by bringing the subject to the teachers' regions so they can balance work and professional development without one coming at the expense of the other," she says. In its second year of activity, the program involves 75 teachers in six communities throughout Israel, thereby reaching thousands of students.

Each regional group is led by teachers who are trained by Eylon, Bagno, Dr. Hana Berger, Ph.D. student Smadar Levy, and other members of the department. In biweekly meetings at the Weizmann Institute, the leaders are exposed to new activities and methods, which they then present in their regional groups. They later report on their experiences using the new activities and approaches in class, and their feedback is relayed back to the department's staff. This bidirectional process leads to honing and improving the activities, and the teachers report an improvement in their skills – and their students' learning.

The number of participating communities doubled in the second year, and it is expected to further increase next year, including the addition of online communities. "The quality of the teacher is the decisive element in learning – it affects students' knowledge and grades, their interest level and their desire to take physics once it becomes an elective subject," says Bagno. "One of our points of focus is customizing the teaching to the learners, so that we can reach beyond the top students to recognize each student's capabilities and talents."

Dr. Tammy Halamish Eisenmann, the Trump Foundation's Program Officer – who is also an alumna of the Science Teaching Department – says: "The program creates a bridge connecting individual teachers to their colleagues, bringing each one's activity into a wider and more significant context, and offering a unique model of professional development for outstanding teachers."

Kobi Schwartzbord, a physics teacher and a community leader in the program, says his participation was a natural extension of his experience in the Rothschild-Weizmann Program for Excellence in Science Teaching at the Weizmann Institute. The M.Sc. program offers advanced professional development to active science and math teachers.

"Physics teachers invest a great amount of time and effort at home, outside of school hours, so commuting to the Weizmann Institute on a regular basis for professional training courses is difficult," he says. "The close-to-home communities make this easier, providing materials and ideas teachers can take to class, and a network of peers who learn from one another."

Spotlight on ISEF Students

Reut Yosef is conducting research on why cells die. Cell death is a normal biological process but one that plays a role in age-related diseases and tissue aging. Interested in better understanding this process, called cell senescence, Reut is studying towards her Ph.D. in the lab of Dr. Valery Krizhanovsky, incumbent of the Carl and Frances Korn Career Development Chair in the Life Sciences. Her interest in this area developed during her master's degree studies with Prof. Avraham Ben-Nun, the Eugene and Marcia Applebaum Professor, when she studied the effect of a particular protein on multiple sclerosis.

Throughout these critical years of her advanced education – and during her undergraduate degree at the Technion – Reut has received grants from the ISEF Foundation, which supports hundreds of Israelis from underserved and immigrant communities through living stipends and/or tuition expenses. At the Weizmann Institute, where all students attend tuition-free, ISEF grants are used by recipients as personal living stipends. In addition to the financial assistance she receives, says Reut, ISEF alumni and current students comprise a worldwide network that she hopes and expects will "be a very powerful tool once I finish my Ph.D."

Reut Yosef and Eldad Marom

Since its founding in 1977 by the late Edmond J. Safra, his wife, Lily, and Nina Weiner – its president still today – ISEF has awarded 19,000 scholarships; more than half of the recipients are the first in their families to be educated beyond high school. In addition to Reut, there are currently three other students on campus who have received ISEF grants.

"Being a member of the ISEF Foundation (as a grantee) has enabled me to focus on my academics – to put my efforts into my Ph.D studies at the Weizmann Institute and broaden the scope of my research," says Eldad Marom, who is studying in the Science Teaching Department.

Weiner says that ISEF, which originally targeted Sephardi students, now makes grants across the Israeli population, and the percentage of female students has grown to about half, up from one-fifth in the early years. "ISEF is dedicated to empowering hundreds of outstanding students," she says.

"It is exciting to see the progress ISEF has made in 36 years of success stories," says Weiner. "We are extremely happy to have been able to increase the number of our scholarships from 250 each year to 500, to be distributing our scholarships to students at 20 institutions of higher learning in Israel, and to have increased our percentage of women to 52 percent, up from 15-20 percent in our early years."

New Prize Established by UK Donors

for outstanding research and written English

A new annual prize was recently inaugurated at the Weizmann Institute of Science, recognizing, for the first time, the written communication skills of Ph.D graduates. The first Lonia and Jose Roth Memorial Prize was conferred by President Prof. Daniel Zajfman at the annual graduation ceremony of the Feinberg Graduate School in May. The prize went to Dr. Arren Bar Even, whose thesis focused on the design principles of cellular metabolism.

The Roth Prize recognizes the exceptional research achievements of a Ph.D. candidate or recent graduate who has communicated research outcomes in a Ph.D. thesis or publication with an equally high standard of writing in English. The ability to write well is a critical skill required of scientists at all stages of their careers, one that goes hand-in-hand with lucid organization of scientific thought. The prize serves to inspire Weizmann Institute Ph.D. candidates to strive toward communicating well and effectively sharing their results with the scientific community at large.

Lonia and Jose M. Roth were Polish Jews whose formative years were disrupted by the outbreak of World War II. Having experienced arrests and the camps, they survived the Holocaust without ever having lost their admiration for science and fine writing. They remained devoted followers of scientific achievement and world literature for the rest of their lives.

The Lonia and Jose Roth Memorial Prize was instituted by Nelson, Joyce and Dr. Alan Roth in memory of their parents and to honor their lifelong support of the Weizmann Institute of Science and of Israel.

Dr. Arren Bar Even

Sculpture:
Dani Karavan

Memorial to the Victims of the Holocaust

Dani Karavan, one of Israel's preeminent artists, left his mark on the Weizmann Institute through several important works. Karavan was born in Tel Aviv in 1930, the son of the chief landscape architect of Tel Aviv. He began studying art at age 14 in Tel Aviv and Jerusalem, continuing his education in Florence and Paris. Karavan, who represented Israel in the 1976 Biennale of Venice, has become known around the world for his site-specific environmental sculptures. His work is exhibited in various acclaimed museums, and he has received numerous international awards, including being named a UNESCO Artist for Peace, an Israel Prize for sculpture in 1977 and the Praemium Imperiale of Japan in 1998.

Memorial to the Victims of the Holocaust (1971-1972) is the central feature of Memorial Plaza, near Weizmann House and the Davidson Institute of Science Education. The sculpture, of bronze and stone, depicts a Torah scroll split in half along its length and bathed in natural light. The white stone cube on which the scroll is precariously tilted is also split through. The scroll is burnt and engraved with names of Jews who perished in the Holocaust and the numbers tattooed on their arms. The angle of the scroll suggests that it hovers in the balance – between taking off in flight and crashing to Earth.

The angle of the scroll suggests that it hovers in the balance – between taking off in flight and crashing to Earth

The sculpture incorporates both fire and water; the latter trickles, like tears, down the inner faces of the stones. Leading to the fire is a channel containing two railway ties – of wood and iron. Words spoken by Chaim Weizmann in Yiddish at a Zionist congress encircle the base of the sculpture.

Between the Tree of Knowledge and the Tree of Life (1962-1964) graces the entrance to the Charles Clore International House, a student residence that is currently undergoing renovation. This is the first bas relief Karavan created; he would go on to create the wall in the main assembly hall of the Knesset in 1964-1965. The work echoes the ancient bas relief carvings of Assyria, Babylon and Egypt. In it, plant elements are intertwined with Hebrew letters, reminding the viewer of the Tree of Knowledge. The Tree of Knowledge is created out of primordial chaos, and the snake is an essential element in the creation of the Tree. The letters form words and sentences relating to wisdom and enlightenment, ultimately becoming a quote from the Book of Amos: "New wine will drip from the mountains and flow from all the hills, and I will bring my people Israel back from exile."

The text is central to the composition, which moves between the Tree of Knowledge and the Tree of Life. Strongly hinting at the endless drive of humans to create, the work is a call to nurture knowledge for the benefit of the living. Knowledge, it tells us, leads to growth and to life itself.

Between the Tree of Knowledge and the Tree of Life

Building Israel's Biotech Industry

Dr. Avri Havron: CEO of Prolor Biotech

Dr. Avri Havron has been one of the leaders of Israel's biotech industry since its early days. The Kiryat Weizmann Science Park in Rehovot, which is today home to hundreds of high-tech offices had "just three or four buildings back then," he recalls. In the intervening years, Havron has held senior positions in some of the country's most successful firms, as well as being involved in some 15 startups. And he has managed to do it all without leaving Rehovot.

Havron grew up in Pardess Hanna, and he received his B.Sc. and M.Sc. in chemistry from the Hebrew University of Jerusalem. When he decided to move in the direction of biochemistry, a friend of the family suggested the Weizmann Institute. "He told me I would get along well with the people there. He wasn't wrong," he says. Havron conducted his Ph.D. studies under the late Profs. Dov Elad and Yossi Sperling of the Organic Chemistry Department. "I was Yossi's first student," he recalls. "I had debated continuing my studies – this was during the Yom Kippur War – and I had not been especially interested in proteins. But then I was exposed to the world of protein science and to a wide variety of research methods. The Institute gave me a solid grounding in those areas – one that set me on my future path."

After receiving a scholarship through the Institute for postdoctoral studies, Havron went to Harvard University, where he worked on developing contrast agents in the new field of computerized tomography. But even as he was making strides in academe, he realized his future would be in a different world. Havron's infectious laugh surfaces when he says: "I wanted more action!"

> ***"I had the privilege of working on one of the first Israeli drugs to be developed and marketed by a major international firm"***

In 1980, Israel Makov, later CEO of the Israeli pharmaceutical firm Teva, invited him to return to Israel and join the founding team of Interpharm, a daughter company of the Swiss firm Serono. Havron headed research and development; the company had obtained the patent for Rebif®, the multiple sclerosis drug developed by Weizmann Institute researcher Prof. Michel Revel, through Yeda, the Institute's technology transfer arm. Though he did not see the product all the way to market, he "had the privilege of working on one of the first Israeli drugs to be developed and marketed by a major international firm."

Havron then moved to Biotechnology General, a company started and run by another Weizmann Institute alumnus, Prof. Haim Aviv. In his 12 years there as vice president for manufacturing and product development, Havron worked on several projects, some of them involving Institute discoveries.

When the Israeli conglomerate Clal Industries decided to invest in biotech, in 1999, Havron and yet another Weizmann graduate, the late Dr. David Haselkorn took the reins. For the next four years with Haselkorn as CEO and Havron as CTO, Clal Biotech invested in and guided a number of startups.

Havron's most recent project is Prolor Biotech Inc., a clinical-stage, biopharmaceutical public company developing long-acting versions of therapeutic drugs utilizing two technologies: one licensed from Washington University in St. Louis and the second from the Weizmann Institute. These technologies have the potential to dramatically reduce the injection frequency of therapeutic recombinant proteins and peptides.

Prolor, which started as a Haifa-based incubator company, was reincorporated by Havron and his partner in 2005. They raised funds to get the company on its feet and started operating it in Kiryat Weizmann Science Park. Today Prolor has 30 employees, a third of them alumni of the Weizmann Institute.

In April 2013, Prolor Biotech announced that it had signed a definitive merger agreement under which OPKO Health Inc., a US based pharmaceutical company, will acquire Prolor in the largest acquisition deal ever made in the Israeli bio-pharmaceutical industry. Following the closure of the deal, Prolor's operations will continue on where they are today: in Rehovot.

Havron says he has remained close to the Weizmann Institute, seeing members of his class rise in their fields and even become dean of their faculties. "Today, I tell students starting out that it's not what you study, it's what you learn," he says with another laugh. "It is what I learned at the Institute, and over the years, that has brought me to where I am today."

Dr. Avri Havron

Thank You

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10 THINGS we didn't know about **Albert Sabin**

Prof. Albert Sabin, discoverer of the most widely administered vaccine for polio, was the fourth President of the Weizmann Institute, from 1970 to 1972, and a member of the Institute's Board of Governors for 25 years. His rivalry with Jonas Salk, who had developed a killed, rather than a live, vaccine, is well known. The Sabin vaccine became the main immunization given to millions of children around the world, even though there was a slightly greater risk associated with its weakened viruses, because it could be given orally and a single dose granted lifetime immunity.

1. Sabin, whose original family name was Saperstein, immigrated with his parents as a young teenager from Bialystok (today in Poland) to Patterson, New Jersey. As a child, he had lost the vision in his right eye in an anti-Semitic rock-throwing incident. He later remarked: "Judaism came to me through my right eye."
2. Finishing high school at age 16, he went on to study dentistry at the urging of a dentist uncle but, after reading *The Microbe Hunters* by Paul de Kruif, Sabin decided to pursue a career in medical research.
3. His first job, while still in school, was to inject mice with the sputum of pneumonia patients. Seeing that many of the patients died before the diagnosis could be made, he developed a way to shorten the procedure to three hours. The test for *pneumococcus* still carries his name.
4. As a lieutenant colonel in the American army in WWII, Sabin isolated the virus that causes sandfly fever, developed a vaccine against dengue fever, studied the parasites that cause toxoplasmosis and developed a vaccine against the encephalitis to which American troops in Japan were exposed.
5. The Salk vaccine was already in use in the US when Sabin's vaccine was ready for trial. His vaccine was first given, in 1958 and 1959, to millions of people in the Soviet Union; as well as being tested on Sabin himself and members of his family.
6. It was also tested on Kibbutz Gat, in Israel. Members of the Kibbutz are still proud of their contribution to the development of the vaccine.
7. It was first given to children in the US in Cincinnati, where Sabin had his lab, on April 24, 1960, dubbed "Sabin Sunday."
8. Sabin was the first president of the Weizmann Institute to serve under the rule requiring the president to be a scientist. In this position, Sabin reorganized the Institute's structure, establishing the five faculties that exist today, a council of deans and a Scientific Advisory Committee.
9. He first met his second wife, Heloisa, at a reception for the Weizmann Institute held in Brazil.
10. He was considered a great humanist – not only because his vaccine saved millions. Sabin donated his strains of the polio virus to the World Health Organization so the vaccine could be made available to developing countries. He truly believed that science, like painting, sculpture or theater, could instill beauty in one's life.