מכון ויצמן למדע
WEIZMANN INSTITUTE OF SCIENCE

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Cover Story

The Kimmel Effect

Visionary philanthropy and friendship took Helen Kimmel to the Nobel Prize ceremony in Stockholm with Prof. Ada Yonath

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Weizmann Global Gathering, May 6-9, 2012

From the President

This year marks the beginning of my second term as President of the Weizmann Institute. It is a great privilege for me to serve in this position, and I would like to thank our Executive Board from the bottom of my heart for putting their trust in me, and for my reelection.

My thanks also go to all of those who have supported me and, especially, to our four vice presidents: Haim Garty, Israel Bar-Joseph, Mudi Sheves and Tsachi Shariv. Their contributions have been crucial to the success we have been enjoying in the past few years.

In my first term, I made it clear that the Weizmann Institute, as an organization that works to shape the future of the world and of humanity, must naturally continue to change and recreate itself. This trend will be even more prominent in the coming years. As an organization, the Institute is unique: We never stand in place, never allow ourselves to rest on our laurels, and we never give in to complacency. We aspire to determine our own future, and are resolved to act in the interest of steady advancement.

A number of projects currently underway are set to change the face of the Institute. These include the Raoul and Graziella de Picciotto Building for Scientific and Technical Support, the Leon and Nella Benoziyo Building for Biological Chemistry, the Nano-Bio Building and the Israel National Center for Personalized Medicine for which our good friend, Lester Crown, has taken the initiative with a generous starting contribution.

One of the main secrets of our strength and success is the close ties between the Institute and its many friends around the world. Those ties are a constant reminder to us of the extent to which strong partnerships are essential to realizing our vision of shaping a better future. This new magazine, which we are launching with this issue, will be an important tool for preserving and strengthening those ties. We hope it will become a major channel for the flow of news between the different parts of our global community – the Weizmann Institute family.

Daniel Zajfman

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- An algorithm developed in the lab of Prof. Yaron Silberberg of the Physics of Complex Systems Department can focus a laser beam under the skin. This may prove useful in the future for certain medical treatments, especially against cancer.

- Dr. Zvika Brakerski, who recently completed his Ph.D. in the group Prof. Shafi Goldwasser of the Computer Science and Applied Mathematics Department, has made significant strides in developing a practical method for performing operations on encrypted information – while it is still encrypted.

- Prof. Irit Sagi and her team developed a clever method of immunizing the body against one of its own proteins – an enzyme that is often involved in disease processes. With the method, they cured an autoimmune-like disease in mice.

For more information, go to: http://wis-wander.weizmann.ac.il/

Prof. Nava Dekel

Antioxidants Prevent Ovulation

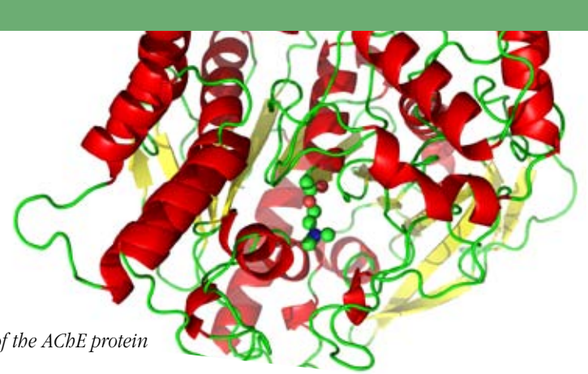
Antioxidants – vitamins C and E, for example – are touted as the cure for aging, said to prevent everything from cancer to wrinkles. But research at the Weizmann Institute shows that antioxidant use could impair fertility, as well. When Prof. Nava Dekel, incumbent of the Philip M. Klutznick Professorial Chair of Developmental Biology, and her research team, including Dr. Ketty Shkolnik and Ari Tadmor, applied antioxidants to the ovaries of female mice, the results were surprising: Ovulation levels dropped precipitously.

Dekel and her team discovered that reactive oxygen species have an important role to play in ovulation – one that is disrupted by antioxidants. These results help fill in a picture that has recently begun to emerge, in which fertility and conception share a number of common mechanisms with inflammation.

The scientists plan to conduct further studies to investigate the exact mechanics of this step in the fertility process. Dekel: "On the one hand, these findings could prove useful to women who are having trouble getting pregnant. On the other, certain antioxidants might prove to be a safe, effective means of birth control."

Preventing Nerve Gas Damage

In the 1990s, Weizmann Institute scientists Profs. Joel Sussman, the incumbent of the Morton and Gladys Pickman Professorial Chair in Structural Biology, and Israel Silman solved the three-dimensional structure of a crucial enzyme called acetylcholinesterase (AChE). This enzyme is responsible for breaking down one of the nervous system's chemical messengers,



Structure of the AChE protein

acetylcholine. AChE malfunction in the brain, for instance, is tied to Alzheimer's disease. But nerve gas also interferes with AChE, and here its effect is swift: Prolonged acetylcholine activity causes continuous muscle contraction, leading to loss of control and, ultimately, death.

In recent research, Prof. Dan Tawfik, the incumbent of the Nella and Leon Benoziyo Professorial Chair, and his group developed an enzyme that breaks down some types of nerve gas before they manage to destroy AChE. Sussman and Silman, together with research student Moshe Ben-David, performed a structural analysis of these enzymes, which were later shown to protect animal test subjects in the USAMIRD labs from two kinds of nerve gas, even at relatively high exposures.

Tawfik's method uses the principles of evolution to create man-made drugs. He and his team took enzymes that could break down the nerve gas – though too inefficiently to be of use – and subjected them to a form of "natural selection" in the lab. The result was an enzyme that is hundreds of times more efficient than the original.

Nano-Surgeon in a Lab Dish

A tiny "nano-surgeon," made of just three genetic sequences, has been shown to kill cancer in a lab dish. Two of the three sequences are short bits (promoters) that activate genes. In the minuscule device – formally known as a "dual-promoter integrator," or DPI – these tiny genetic bits sense the activity of specific, naturally-occurring promoters in cells. These promoters go into overdrive in cancer, and if the DPI senses that levels are too high, it activates the third genetic sequence: a "killer" gene that destroys the cancer cell.

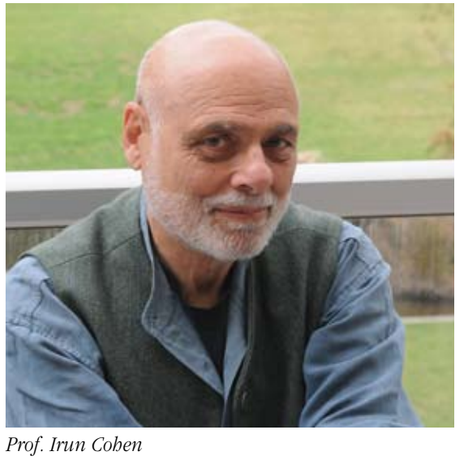
The device's creators, Prof. Roy Bar-Ziv and Dr. Lior Nissim, point out that the DPI is designed to be so sensitive that it can even distinguish premalignant cells from cancerous ones. Though much research needs to be done before this technology can be tested in a human body, Yeda Research & Development, Ltd., the Weizmann Institute's technology transfer arm, has patented the nano-device.

Successful Trial

DiaPep277®, a treatment developed by the Institute's Prof. Irun Cohen for use in Type 1 diabetes, was shown to be effective in phase III clinical trials.

In the trials, conducted by Andromeda Biotech, patients treated with the drug for a year or more had significantly higher pancreas function than those in the control group. Further data analysis is underway, and a second trial planned.

Prof. Roy Bar-Ziv



Prof. Irun Cohen

Complex by Design

WHAT WE ARE DOING ABOUT
SYSTEMS BIOLOGY

Systems biologists are something like modern sociologists. If traditional biologists are more like psychologists, examining individual cells, molecules or atoms in depth, systems biologists look at the "social network" that arises when all of these link together. And, just as sociologists study Facebook to try to understand how a collection of individuals can bring about a national uprising, systems biologists find emergent behavior in the actions of biological components. According to Prof. Yitzhak Pilpel (see p.6), among other things, systems biology may yield new insights into cancer, which may be more of a systems failure than one of isolated genes and proteins.

Kartoshkes playback theater troupe

Prof. Uri Alon, incumbent of the Abisch-Frenkel Professorial Chair, wrote the book on systems biology – literally. His university level text, *An Introduction to Systems Biology: Design Principles of Biological Circuits*, has been hailed for its clear writing and accessibility as well as its unique approach. Alon, like a number of researchers at the Institute, began his career in one field – physics – and moved over to biology. Yet it is precisely his training in physics that enables him to find patterns in the complex world of living organisms. In the dynamic bustle of a cell or the twists and turns of evolution, for example, Alon has identified repeating patterns, or "motifs," that hint at a somewhat coherent, underlying simplicity, helping scientists to define general principles of life. In this view, nature achieves designs that look like remarkable engineering using just evolutionary tinkering and natural selection to adapt the elements at hand – the genes, proteins, cells, organs and limbs – to an endless variety of forms and actions.

Look in the library

In investigating biological circuits, Alon and his group have developed new tools to cope with the complexity of living systems. For instance, they invented a method for imaging the activities of living cells and performing an automated computer analysis that enables them to investigate thousands of cells at once. They then used this method to observe the behavior of 1,000 different proteins in individual cancer cells. Their question: What distinguishes the few cancer cells that survive chemotherapy – leaving the door open to recurrence – from those that don't?

The team effort, which took several years to complete, produced a comprehensive library of tagged cells, images and data on cancer cell proteins that will provide an invaluable resource for further cancer research. Using the new method, the researchers followed the reactions of the cancer cell proteins to a chemotherapy drug, tagging the various proteins with fluorescent markers and creating "time-lapse" films of each. After the drug was introduced, the cancer cells began the process of either dying or defending themselves against the attack.

Two proteins exhibited unique behavior: They increased in some cells and decreased in others. The cells in which the proteins increased tended to survive the drug. Indeed, additional experiments showed that these proteins help cancer cells survive chemotherapy. Interfering with these proteins made the drugs more potent. This research provides a clue as to how to develop treatments to kill off those few cells that escape anti-cancer drugs.

Kartoshkes

In addition to running a large lab and spending time with his family, Prof. Uri Alon is a member of the theater troupe, Kartoshkes. The troupe performs around the country with a method called "playback theater" – a combination of improvisation, music and storytelling in which they act out stories told by the audience.

"The stage is a microscope for understanding human relationships," says Alon. He is now working on a plan for creating a "theater-lab," in the framework of the new Braginsky Center for the Interface between Science and the Humanities. There, he hopes to bring actors and scientists together to apply both the tools of the natural sciences and the unique insight of the theater to gain new perspectives on human creativity, cooperation and behavior.

Prof. Uri Alon

Traffic Control the RNA Way

The work of Prof. Yitzhak (Tzachi) Pilpel, the incumbent of the Ben May Professorial Chair, deals with the basic principles governing interactions between various genes, genes and proteins, genes and the environment, and so on. He discovered, for instance, that sometimes similar genes can substitute for one another in a pinch. In other research, he identified practical differences between genetic "synonyms" – different three-letter DNA sequences that encode the same amino acid link in a protein.

Ribosomes, in truth, resemble mobile production lines: One after another, they move down a long strand of RNA

Ribosomes on the road

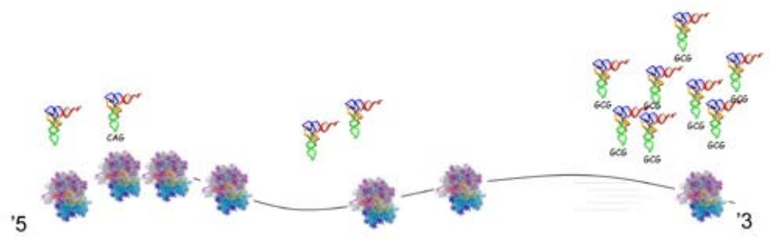
Those practical differences come down to the speed at which the ribosomes – the cells' protein factories – read the encoded instructions from the messenger RNA and assemble amino acids into proteins. Each three-letter sequence in the RNA summons a "carrier molecule" to fetch the required amino acid. But some are more uncommon than others and take longer to appear, thus slowing down the process.

This natural speed control showed up again in an investigation into "traffic patterns" of working ribosomes. Ribosomes, in truth, resemble mobile production lines: One after another, they move down a long strand of RNA, fabricating multiple protein molecules from a single instruction list. Sometimes, many ribosomes travel the same RNA "road" at once: What prevents collisions and traffic jams?

Pilpel's research showed that with ribosome traffic, the rarer carrier molecules act as "ramp meters" in the RNA. Like the highway ramp meters that delay cars at the entrance, these biological ramp meters slow down the pace of protein production near the beginning of the road, holding up traffic at strategic points and ensuring a smoother flow ahead. This bit of natural traffic engineering is ancient – found in organisms from bacteria to humans – and it might help scientists working on techniques for genetic engineering and protein synthesis to improve the efficiency of their methods.

This bit of natural traffic engineering is ancient – found in organisms from bacteria to humans

Prof. Yitzhak (Tzachi) Pilpel



"Ramp metering" of ribosomes on mRNAs. Ribosomes (purple-blue structures along the RNA "road") are dense and slow at the beginning when the tRNA carriers (above) are rare, and sparse and fast when the tRNAs are more plentiful

Supporting Systems Biology

Morris Kahn and the Kahn Foundation were the earliest major supporter of systems biology at the Institute. Starting with a major investment five years ago, this support enabled the seeds of the field to take root. The year 2011 was a banner year for giving in this area, reflecting the growing recognition of the field as key stepping stone to discoveries about human health and disease. The Institute named three new professorial chairs for systems biologists: Prof. Uri Alon is the first incumbent of the new Abisch-Frenkel Chair; Prof. Naama Barkai the first incumbent of the Lorna Greenberg Scherzer Chair – dedicated in the donor's presence in a November ceremony; and Prof. Yitzhak Pilpel is the first incumbent of the Ben May Chair.

Also established this year was the Sharon Zuckerman Laboratory for Research in Systems Biology, headed by Prof. Pilpel.

In addition, the growing partnership between the Institute and Harvard University in systems biology was seeded earlier this year by Board member Pierre Schoenheimer, which enabled a major colloquium on campus last spring involving 60 Harvard scientists.

The most recent transformational gift came from David and Stephanie Azrieli and the Azrieli Foundation of Canada, which established the Azrieli Institute for Systems Biology. The Institute, which was dedicated at a dinner during the November meeting of the International and Executive Boards, will seed a wealth of systems biology projects across campus. "Now we have reached the point of maturation in the field where we are in need of a much bigger financial engine," said President Prof. Daniel Zajfman at the event. "David Azrieli and the Azrieli Foundation have chosen to take a leadership role in this effort. The Azrieli Institute will be a flagship operation at the Weizmann Institute, and will no doubt enhance our capabilities, continue to attract leading young scientists, and spur new high-profile collaborations such as the one we now have with Harvard University."

Speaking at the event, David Azrieli said that throughout his life he revered the pioneers of Israel who cleared its swamps and settled its land, enabling life to take root. "The pioneers of today's Israel are its scientists," he said. "They will create Israel's future and the future of the world we live in."

(l-r) David Azrieli and Prof. Daniel Zajfman at the dinner for the establishment of the Azrieli Institute for Systems Biology

Scale Model

How do growing organisms "keep everything in proportion?"

Prof. Naama Barkai

How does one describe a system? Can one, for example, look at a system as complex as the one that guides the development of an embryo and deduce its general principles? For Prof. Naama Barkai, the incumbent of the Lorna Greenberg Scherzer Professorial Chair, understanding living systems involves combining experimentation in the lab with theoretical studies – using experimental results to build mathematical models and retesting those models in the lab.

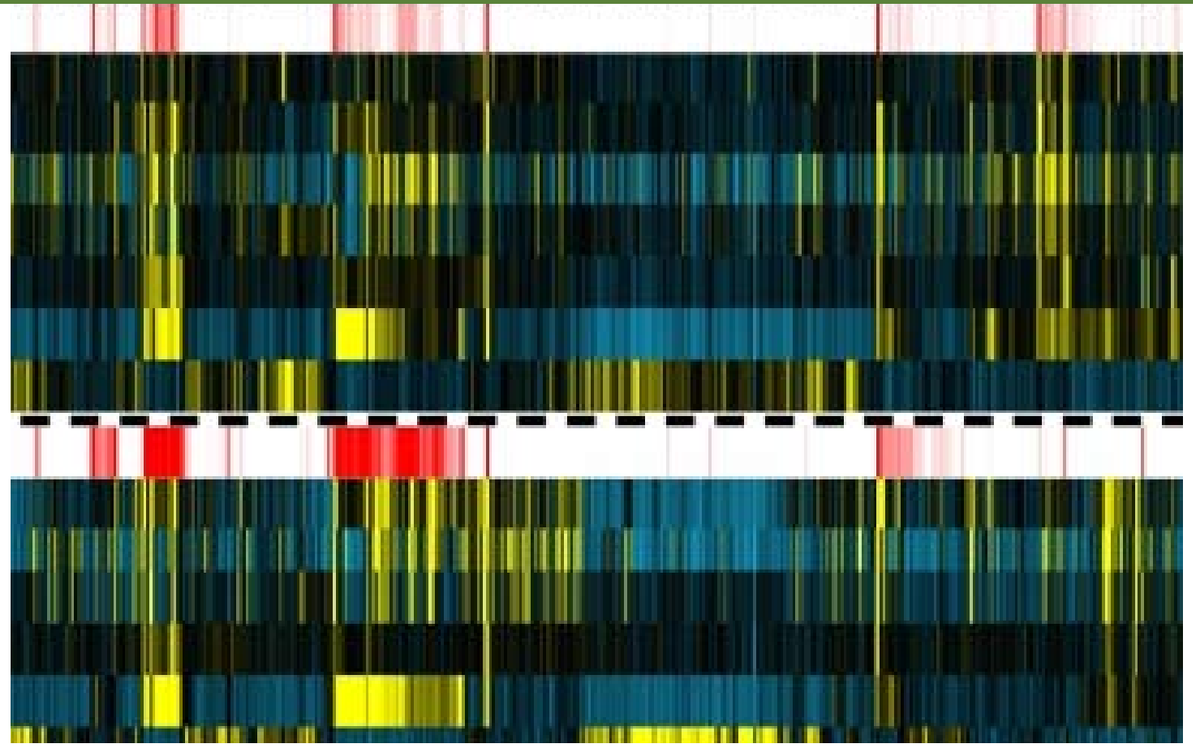
For instance, several years ago, Barkai, Prof. Ben-Zion Shilo and research student Danny Ben-Zvi recreated an 80-year-old experiment in which frog embryos were split in half, with cells from the back half of one transplanted onto the belly half of another. The result was a "Siamese twin" tadpole with two perfectly-formed heads. Even more surprising was that all of the organs in these embryos were smaller than normal, but perfectly proportioned.

Over the next several years, the Weizmann team would finally unravel the 80-year-old mystery, producing a mathematical model that explains how scaling works in organisms from fruit flies to humans.

In the frog embryos, they knew that a substance called a morphogen is produced in one part of the developing embryo and diffuses outward. The concentrations of this morphogen were thought to give the developing cells in the embryo information about their place in the greater scheme. But a preliminary model of morphogen distribution implied that this, on its own, would not produce scaling, in which each organ develops to the precisely the right size in relation to the whole. A second substance was needed, and, indeed, when they looked for it, the researchers found a second molecule secreted elsewhere in the frog embryo.

Further mathematical modeling painted a picture of a system in which one substance is created in the center of the embryo, the other at the edge. As the "expander" substance seeps in from the edge, it aids in the distribution of the morphogen that is diffusing from the center. The central morphogen, called the "repressor," also controls the levels of the expander by eventually suppressing its production.

How accurate is the model? The team went back to the lab to see if it could be applied to one of the more exquisitely scaled systems in nature – an insect's wing. Looking at the discs from which wings develop in fruit fly larva, they found the same pattern, even though the substances, themselves, were quite different. Among other things, models like these can greatly simplify research. Rather than the "needle in a haystack" approach, suggests Barkai, one can look for the pattern and then identify the substances involved.



Epigenomic mapping for the 8q24 "gene desert." Hot spots show up in yellow

Dr. Amos Tanay

Hot Spots

Cancer begins in the genes: Environmental damage to our DNA and accumulated mutations can initiate cancer processes. But cancer is also promoted by regular genetic sequences that originally serve other purposes, for example, advancing normal growth and development.

Where are these cancer promoters? Dr. Amos Tanay, a computer scientist, believes we need to extend the search.

Most studies look within the human genome – the set of genes encoding the proteins in our bodies. But our chromosomes contain billions of DNA "letters" – much more than the protein-coding genes – and fresh research is turning up crucial bits of code for regulating the genes' activities in these once ignored regions.

Using powerful new sequencing methods developed in recent years (some at the Weizmann Institute), Tanay and his team undertook a fruitful hunt for cancer-promoting factors in a large "gene desert," a half-million letters long, called 8q24. After mapping the entire region and finding "hot spots" of activity, they isolated a number of suspect DNA sequences and inserted them into cells in the lab. From thousands of possible cancer promoters, the researchers narrowed the search down to a few coded sequences that enhance the activities of genes. Key to their findings is the fact that a known cancer gene sits right at the edge of the gene desert.

Tanay and his team think that these enhancers come into physical contact with the cancer gene when the whole genomic sequence folds over on itself. "If our previous concept of the genome resembled a neatly laid out, linear instruction list for producing proteins," says Tanay, "the picture that is now emerging seems to be closer to a tangled bowl of spaghetti." And that untidy tangle, if we can decipher its crossings and overlaps, might tell an interesting story indeed.

By the Numbers

The efficiency of the average enzyme leaves room for improvement

Need to know the size of the largest protein? The number of olfactory receptors in the nose? How much time it takes for organic plant matter to turn over in the ocean? These values and

Why is this amount of the enzyme produced, and not ten times more?

thousands more can be found on the BioNumbers site www.BioNumbers.org – the brainchild of Dr. Ron Milo, the incumbent of the Anna and Maurice Boukstein Career Development Chair in Perpetuity.

Milo's research demonstrates how a firm grasp of the numbers behind the biology can lead to new insights in the life sciences: "Rather than ask what a particular gene encodes or the function of a specific enzyme, we ask 'Why is this amount of the enzyme produced, and not ten times more? Why does a certain biological activity take place at a specific rate?' Once we are able to quantify these processes, we can make meaningful connections – for instance, between the enzymes that fix carbon in photosynthetic organisms and carbon dioxide levels in the atmosphere."

In a recent study, Milo and his group, together with his student Arren Bar Even and Prof. Dan Tawfik of the Biological Chemistry Department, addressed the issue of enzyme efficiency. Comparing data from the scientific literature on thousands of enzymes, they realized that the efficiency of the average enzyme is quite a bit lower than its theoretical ideal. Among other things, this finding has suggested to the scientists that there might be room for improvement.

For instance, Milo is looking into the possibility of designing microorganisms that would efficiently remove carbon dioxide from the atmosphere. Rather

He might get better results persuading a few of the "lazier" enzymes to step up their performance

than trying to adapt a main enzyme in the photosynthetic process – one that is already highly efficient – he thinks he might get better results persuading a few of the secondary, "lazier" enzymes to step up their performance and work together.

Background: Bacterial lawn of colonies, colored with three fluorescent proteins modulated with ribosome binding sites, demonstrates the ability to span protein expression in space

Green Labs

Dr. Ron Milo's research aims to help solve some of the most pressing environmental issues – atmospheric carbon, agricultural productivity, etc. But he is also committed to helping the environment on a day-to-day, local level. Together with another two like-minded young scientists, he initiated a new "green campus" project at the Weizmann Institute. Though the initiative is still in its infancy, he has been amazed by the number of responses and suggestions he has received from the Weizmann community.

"Saving water and electricity, recycling – these are all things I do in my daily life with my family. Now, I have the chance to try to influence the habits of 3,000 people and convince them to be environmentally aware and responsible."

Dr. Ron Milo

The Kimmel Effect

Visionary philanthropy and friendship took Helen Kimmel to the Nobel Prize ceremony in Stockholm with Prof. Ada Yonath

No one can win a Nobel Prize alone. There are, always, many partners along the way. But if you ask Prof. Ada Yonath of the Weizmann Institute of Science, the 2009 Nobel laureate in chemistry, about those who assisted her throughout the years in her scientific adventure, she says: "Many helped me along certain parts of the way. But only one was a real partner throughout this entire marathon. That was Helen Kimmel."

In partnership with her first husband, Milton Kimmelman and, after his death in 1984, with her second husband, Martin Kimmel, Helen was the first major philanthropist to take a deep interest in Prof. Yonath's scientific challenge: deciphering the structure of the ribosome, a tiny organelle that translates genetic information and builds proteins – the tools of life. In the 1980s, Helen began to invest in Prof. Yonath in a big way – at a time when others saw her as a dreamer trying to pursue a mission impossible.

"As a scientist, having a generous donor who cares about your research and is there to give you backing can make all the difference in truly advancing the field," says Prof. Yonath, incumbent of the Martin and Helen Kimmel Professorial Chair in Structural Biology and director of the Helen and Milton A. Kimmelman Center for Biomolecular Structure and Assembly. "For me, Helen Kimmel has been that person. She paved my way."

A family matter

It all began on a plane, when Helen and her first husband, Milton, took their first trip to Israel together in 1980. They met a couple who were going to the Weizmann Institute's annual board meeting, and they invited the Kimmelmans to join them. There, they met Prof. Michael Sela, then-president of the Institute. The rest is history.

A keen interest in science and math has played a fundamental role in Kimmel's life, guiding her philanthropy and the choices she makes about the people with whom she surrounds herself. At the Weizmann Institute, her support over three decades has been based on warm and close relationships with its leadership and scientists. Her relationship with Weizmann, begun in partnership with her husband Milton; through her 20-year marriage to her second husband, Martin Kimmel, until his death in 2008; continues today. The Kimmelmans, then the Kimmels, have touched every corner of the Weizmann campus, but with a special predilection for the Faculty of Chemistry.

"As a scientist, having a generous donor who cares about your research and is there to give you backing can make all the difference in terms of truly advancing the field."—Prof. Ada Yonath

Helen Lyttle was born in 1920 and grew up in Manhattan and Long Island, where she attended the prestigious Lawrence Woodmere Academy. There, "a wonderful teacher," she says, named Edward Kasner kindled her interest in math "by explaining it all clearly and making it fun." She kept his book, *Mathematics and the Imagination*, published by Simon & Schuster in 1940, at her side throughout her life and read it many times over.

Love of science and math was a family matter among the Lyttles. Her father didn't finish high school before he immigrated to the US from England, but he "wanted the best education for us," says Helen. He managed a successful dress business. Her mother took care of the four girls. One (now deceased) received a Ph.D. in botany and went on to a career in academia, first at Yale University and then at the University of Connecticut. A second sister, Ruth, who resides in the New York area, received a Ph.D. in math and went on to head the math department at Barnard College. A third sister died at a young age.

A math major, Helen attended Bryn Mawr College in Pennsylvania for two years, then transferred to Barnard, graduating at the height of World War II. She and her sisters were part of the one percent of American women who attended college in those years, and she admits feeling very lucky for the opportunity, especially at a time when European Jewry and the world were in turmoil.

She didn't pursue a career, choosing instead to travel with her new husband, Milton. They had three children: Abby, Betsy and Peter.

A fateful meeting

The Kimmelmans' first gift to the Institute was a general research grant; next, they established two career development chairs for promising young scientists. After Milton died in the spring of 1984, Helen wanted to memorialize him in a creative form. She got on a plane to Israel that summer, prepared to meet Institute computer scientists and fund a new project in memory of her husband. "But I got there and the computer scientists were abroad," she recalls.

When Helen returned to the campus the next year, the Institute's Scientific and Academic Advisory Committee (SAAC) had just completed its annual evaluation of a single research field within the Institute; that year the focus was biomolecular structure and assembly. Prof. Sela advised her that her dollars would best be spent on that area, and SAAC members Dr. Christian B. Anfinsen and Sir John Kendrew, both Nobel laureates in chemistry, concurred. "They told me: 'This is where explosive developments will take place in the next 20 years.' And indeed they were right," recalls Helen after attending the Nobel Prize ceremony in Stockholm with her daughters and sharing the big moment with Prof. Yonath when she received the award.

That advice, and her awe of Prof. Yonath's legendary persistence – she made 25,000 attempts to crystallize ribosomes – impelled her to focus her resources on the scientist.

Helen established Yonath's professorial chair in 1986 and the research center a year later. Research centers or institutes fund scientific investigations in a particular field and enable collaboration between scientists, both among research groups at Weizmann and elsewhere. By injecting funding into a particular field of research, Helen aimed to play a role in taking that research to a new level.

The two women became fast friends; they keep in touch regularly and meet often. "Helen cares a great deal about the science she supports, and sees that it is going to make a difference in medicine, in understanding how the world works," says Prof. Yonath.

"They told me: 'This is where explosive developments will take place in the next 20 years.'"—Helen Kimmel

Helen says she gets "great satisfaction" from her close relationships with the scientists she supports, visiting them on campus and keeping abreast of their work by phone and e-mail throughout the year. And they are many: Kimmel funding has supported more than 60 scientists – through multiple vehicles. She has hosted many scientists at her home over the years – including at one fateful dinner in her Manhattan apartment in 1986.

Serendipity

Martin Kimmel had visited Weizmann with his son Adam, and he made a gift almost immediately upon returning to New York. That got him a place on Helen's invitation list.

The Kimmel Award "is one of the most innovative, visionary, and ultimately productive means to advance scientific research."—Prof. Rafael Malach

She hosted some 100 Weizmann scientists and donors, and other guests, that evening at a black-tie event. Martin accepted the invitation, but told his driver to keep the engine running, promising he'd be back downstairs in 15 minutes after a quick drink. When Helen answered the door, his plans changed. He called the driver and told him he was free to leave.

"Weizmann brought me Marty," she says. The couple married two years later.

Martin had built his wealth with his own wits, through his real estate business, Kimco Corp., one of the largest builders of strip malls in America. He retired in 1991 and spent his remaining years devoted to philanthropy, with Helen, until his death in 2008.

Soon after their marriage, the Kimmels financed the acquisition of 50 acres of land adjacent to the Institute, increasing the campus area by 20 percent – a resounding confirmation of their faith in the Institute's future. And since that 1990 gift, the couple's footprint on the Weizmann campus became increasingly evident. Prof. Reshef Tenne was one of the first Weizmann Institute scientists to get to know Helen and Marty, and he has headed the Helen and Martin Kimmel Center for Nanoscale Science since its creation in 2003.

"The Kimmels' desire to give for the betterment of mankind had no limits," he says.

The Kimmels' "forward-thinking understanding of human nature" was what motivated them to establish the Kimmel Center for Archaeological Science, says Prof. Stephen Weiner, the Center's director.

The Institute bestowed them with honorary Ph.D.'s – Helen in 1987 and Martin in 1997. For the Kimmels, who also have given generously to New York University and the Israel Museum, their contributions throughout the years have been closely tied to their trust in the people at the helm. "I bet a great deal on people, as I did with Ada, and with Daniel (Zajfman)," referring to the president. "Every institution faces challenges and sets its goals, but if the right ingredients are in place – the right people, as Weizmann has – then that's the best possible recipe for success."

The Kimmels

Helen and Martin Kimmel with Prof. Ada Yonath

The Kimmel Award for Innovative Investigation

The Helen L. and Martin S. Kimmel Award for Innovative Investigation is a $1 million grant, over five years, to one outstanding Weizmann Institute researcher each year. The award allows scientists to take on high-risk, high-gain projects – ones that traditional funding sources typically shy away from. Recipients to date and their research foci:

- Prof. Naama Barkai, Molecular Genetics and Physics of Complex Systems Department (2007): One of the pioneers of systems biology, a physicist-turned-biologist who explores the design principles of living systems
- Prof. Yinon Rudich, Environmental Sciences and Energy Research Department (2008): Explores the fundamental chemistry and physics of climate, focusing on one of the major missing pieces of the global climate puzzle: aerosols
- Prof. Rafael Malach, Neurobiology Department (2009): Is defining how the brain processes sensory information into meaningful perception
- Prof. Lucio Frydman, Chemical Physics Department (2010): Develops new methods of nuclear magnetic resonance analysis to study disease
- Prof. Omer Reingold, Computer Science and Applied Mathematics Department (2011): Applies the concept of randomness to computer problems for use in algorithm design, cryptography, coding theory and network design

Prof. Malach on the Kimmel Award:

"It is one of the most innovative, visionary, and, ultimately, productive means to advance scientific research. The award created the opportunity for me to proceed with research that has recently yielded an important discovery in the field of mental disorders, in schizophrenia."

All in the Brain

WHAT WE ARE DOING ABOUT
BRAIN RESEARCH

Weizmann Institute neurobiologists are world leaders in the field of brain research, from understanding the mechanisms of learning and memory to revealing the intricacies of perception, how the brain directs actions in the body, the basis of addiction and more.

As a result of Weizmann's sterling leadership, it was chosen to initiate one of the first four Israel Centers of Research Excellence (I-CORE) set up by the Council for Higher Education. Called "Advanced Approaches in Cognitive Science," and headed by Prof. Yadin Dudai, it includes scientists and researchers from around the country.

Corn snake in the neurobiology lab

A question from the prime minister:
Brain research at the Institute began with a question that Prime Minister David Ben Gurion once asked Weizmann scientist Prof. Uriel Littauer: "Young man," he said, "why don't you study the brain?"

We might be quite certain that our memories are accurate records of events, untainted by emotions or the suggestions of others. On the other hand, such feelings as a burst of courage or an instant "click" of understanding may seem to strike out of the blue. But according to Prof. Yadin Dudai, the incumbent of the Sara and Michael Sela Professorial Chair of Neurobiology, what we think or feel does not completely reflect what is happening in our brain at the time.

To capture these mental processes as they occur, Dudai and his group ask volunteers to perform specific tasks while their brain activity is scanned in the Institute's functional magnetic resonance imaging equipment (fMRI). An fMRI reveals where blood flow (which is correlated with neural activity) is heightened in the brain and thus, where the main activity is taking place. By meticulously analyzing these data, Dudai and his team unveil the brain mechanisms that underlie specific behaviors.

Showing courage

In the courage experiment, for example, snake-fearing volunteers were given the challenge of pushing a button to slide a live corn snake on a nearby moving trolley toward their heads. For subjects that managed to overcome their fear and bring the large, but harmless, snake closer, the fMRI scans revealed a unique activity pattern – one that suggests that the fear does not abate, but the repression of activity in other brain areas enables them to "disconnect" from the emotion enough to act.

False memories

False memories, it seems, are surprisingly easy to substitute for the real thing. Dudai and his team found that some implied social pressure – telling volunteers that the other members of a group had given different answers on a memory test – was often enough to transform their actual memory of a scene in a film. When it was revealed that the group responses were in fact made-up, a large percentage continued to stick to an incorrect answer. In other words, say the scientists, their memories had been falsified. The fMRI results showed that the formation of false memories entails a signature pattern of brain activity: A brain region called the amygdala – previously better known as the emotion center of the brain – was involved in preserving the false memories.

Aha!

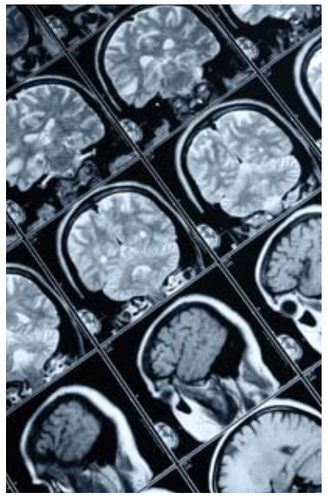
Insights that come upon us in a flash are remembered particularly well. To recreate that "aha" moment, Dudai and his team presented subjects with highly degraded photos followed by a quick, enlightening peek at the solution. The researchers were able to identify the sudden clicks of insight in the fMRI results, and they even used these results to predict which images would be remembered in repeat test a week later.

Here again, even though the pictures had no emotional content, the amygdala was involved in preserving these memories. Though its exact role in memory formation in general is still unclear, the scientists now believe the amygdala has a say – possibly as a gauge of relevance – in the brain's decisions as to which memories get stored in the long-term memory banks.

Prof. Yadin Dudai

All in the Brain

Reversing the Response



fMRI brain images

Stress is a part of daily life, and our physiological responses – anxiety, sweaty palms, beating heart – evolved to help us cope with natural threats. Dr. Alon Chen, the incumbent of the Philip Harris and Gerald Ronson Career Development Chair, investigates what happens in the brain after the threat has passed, when our heart rate slows again and anxiety abates. To return to normal, the body must actively reverse the stress response; Chen has identified a family of proteins that do just that. What happens when these proteins somehow don't switch that response off in time? Chen's findings imply that such problems as post-traumatic stress syndrome, anorexia, anxiety disorders and depression may be tied to failures in this system, and they have suggested new avenues of research into these syndromes.

Return to normal

The proteins, known as urocortin 1, 2 and 3, are related to another protein that is responsible for initiating the stress response in the first place. Chen and his team created genetically modified mice that were missing the urocortin proteins. These were at first indistinguishable from the control mice; only 24 hours after both groups had been subjected to a stressful episode did the differences become apparent. While the behavior of the control mice had returned to normal, the urocortin-free mice continued to exhibit high levels of anxiety. Checking which genes were active during this period, the researchers found that the gene expression patterns in the control mice underwent a significant swing in the 24-hour period while those of the genetically-modified mice remained more or less constant. In other words, says Chen: "Without the urocortin system, the 'return to normal' program couldn't be activated."

To return to normal, the body must actively reverse the stress response

The long term

Other research conducted in Chen's lab hints that the effects of urocortin may be pervasive, and that modern lifestyles, with their constant pressure, could be affecting this regulator of our stress response. When he and his team increased levels of just one family member – urocortin 3 – in just one part of the mice's brains, not only did the mice's anxiety levels increase, the team noted changes in their metabolic rates. They burned more sugar and less fat – a change that soon led to insulin insensitivity and even signs of Type 2 diabetes. This metabolic change may be useful for giving our muscles a short-term boost of energy, but Chen thinks it is possible that constant low levels of stress could affect the balance between these proteins and thus, the body's long-term metabolism.

Dr. Alon Chen and his lab team

First Odors

Why do certain smells seem to be inextricably tied to childhood memories? The answer, according to Prof. Noam Sobel of the Neurobiology Department, lies not in the ways we remember childhood, but rather in the way that the first time we encounter a particular smell imprints the experience in our memory.

To test this hypothesis, Sobel, together with research student Yaara Yeshurun and Prof. Yadin Dudai, had volunteers view a number of images while smelling one of two odors and later asked them to recall which odor matched which image. A week later, the subjects were given the test again, with different image-odor pairings.

Functional magnetic resonance imaging (fMRI) conducted during both series of tests showed a unique pattern of brain activity the first time an image was linked to a smell in the subject's memory. Just by looking for this pattern, the scientists were able to predict which odor the volunteers would recall in association with each image. This phenomenon seems to be unique to smell. When the scientists repeated the experiment with sounds and images, they found no such first-time links.

Prof. Noam Sobel

Emotional Give and Take

Even if we believe ourselves to be highly rational and level-headed, it turns out that the part of our brain in which our most basic feelings arise has a say in everything from how we perceive the world around us to how we remember. Dr. Rony Paz, the incumbent of the Beracha Foundation Career Development Chair, says that the various parts of our brain are engaged in constant conversation, which can serve to heighten our experience and enhance our memory or, alternately, to repress certain facets of perception and memory.

You are much more likely to remember the details of the birth of your first child than what you ate for breakfast just yesterday morning

Dr. Rony Paz

For instance, Paz points out that you are much more likely to remember the details of the birth of your first child than what you ate for breakfast just yesterday morning. That is because the emotion center in your brain – the amygdala – gets involved in laying down these happy memories. But what about negative emotions – the ones you might be better off repressing? Such prolonged or extreme situations as wartime stress or sudden, frightening events can lead to post-traumatic stress disorder. In this case, that conversation can become a sort of monologue in which the victim continually relives the trauma. Why does this happen?

Affected by adversity

Paz provided a piece of this puzzle when he conducted an experiment on perception and adversity. Subjects were asked to listen to different tones and try to distinguish between them. But the tones were also accompanied by another stimulus – in this case a smell that was nice, neutral or highly unpleasant. When the subjects smelled the unpleasant odor, they had a harder time telling two similar tones apart – even if they were able to do so before. In other words, the association with adversity, in the form of a bad smell, was causing their perceptions to become blurred.

Paz believes this tendency may have served a purpose in our evolutionary past. The growl of a prowling lion, for instance, might be slightly different from the one you heard before, but your survival could depend on your instantly hearing it as identical and switching on the familiar panic response. Today, however, a part of our brains may perceive all cars as the same one in which we experienced a frightening crash and warn us away. "It may be," says Paz, "that people whose perceptions blur more easily under so-called 'adverse conditioning' may be more susceptible to post-traumatic stress."

(l-r) Prof. Rafael Malach and Dr. Ilan Dinstein

Scan while They Sleep

A diagnosis of autism is usually possible only after the age of about three or four. Even then, the tests are mostly subjective, based on behavior. A more objective, earlier test for the disorder might help children receive help at a younger age; and a diagnosis based on brain activity could help researchers zero in on the causes and development of autism.

Prof. Rafael Malach, the incumbent of the Barbara and Morris L. Levinson Professorial Chair in Brain Research, and postdoctoral fellow Dr. Ilan Dinstein, working with groups at Carnegie Mellon University and the University of California, San Diego, have taken the first steps toward developing such a diagnostic test. What's more, the test is done in an fMRI while the subject is asleep, meaning it can be performed on very young children.

The scientists knew, from the work of Malach and others, that much of the brain is constantly active – even during sleep. The question was, would signs of autism be identifiable in sleeping brains? To find out, the researchers scanned the brains of sleeping toddlers in the fMRI.

Indeed, they identified a clear biological marker in the activity patterns of the sleeping children's brains: Those of the autistic children exhibited low levels of synchronization between the hemispheres of the brain in very specific areas. Whereas the two halves of a sleeping brain normally enter into a state of even, coordinated fluctuation, in the autistic brains, this coordination was relatively weak between the corresponding areas for language and communication. In fact, the scientists found that those who exhibited the weakest synchronization were likely to have the severest symptoms of the disorder.

The researchers correctly identified autism in 70% of the sleeping toddlers between ages one and three. They plan to continue this line of research in hopes of finding additional markers that might further improve the accuracy of the test.

Campus Tours

Anyone who has visited the Weizmann Institute knows it is a unique place. Not only is the campus a shady green haven with sculptures dotting its lushly landscaped grounds, but it was the home of the first President of the State of Israel, and its various buildings span the history of architecture in the country.

In the spring and summer, a series of campus tours was offered to the public, and these proved to be immensely popular. Over the last year, more than 1,000 members of the public and Institute staff joined one of the four tours on offer. In the trees and gardens tour, participants walked through a few of the more spectacular gardens and learned the stories of some of the rare and unusual trees that have been planted at the Institute over the years. A tour of the outdoor sculptures gave visitors a lesson on modern art and the artists – Menashe Kadishman, Salvador Dali and Yigal Tumarkin, to name a few – whose works grace the Institute grounds. Others chose a walking tour of campus architecture, from the 1930s buildings planned by the architect Erich Mendelsohn and others to the to the iconic floating "spaceship" particle accelerator built in the 1970s to the most recent postmodern glass-covered structures. Yet others took the opportunity to tour Weizmann House, the restored residence of Vera and Chaim Weizmann, which served as the state's first presidential residence.

A Match Made in Rehovot

Decades after Dr. Celia Zwillenberg made Aliya and worked as a researcher at the Weizmann Institute of Science, she and her husband Dr. Lutz Zwillenberg have donated funds for the career development chair whose first incumbent is a new immigrant scientist, Dr. Kobi Abramson.

In a special dedication ceremony on Sept. 22, Zwillenberg, who is originally from Argentina and moved to Israel in 1960, said she chose Dr. Abramson as the first incumbent of the Dr. Celia Zwillenberg-Fridman and Dr. Lutz Zwillenberg Career Development Chair because of her interest in his research area – immunology – but also because she felt a special connection to Abramson as a new immigrant. During her seven years at the Institute, Zwillenberg worked in the lab of the late Prof. Natan Sharon in the Biophysics Department.

She met her husband while he was on a visit to the Institute for a scientific conference. She left for Switzerland with him in 1970, where Lutz runs a large and successful lab in Bern to this day.

Zwillenberg said that she and her husband determined that the best way to show their gratitude was "to create a new opportunity for other young scientists."

Abramson was born and raised in Prague. After first coming to the Weizmann Institute as high school student in an international science camp, he vowed to return. He earned his M.Sc. in biochemistry from the Institute of Chemical Technology in Prague in 2000, returning to the Weizmann Institute to complete his Ph.D. in 2005.

He did postdoctoral research at Harvard Medical School before making Aliya and returning to the Weizmann Institute – this time as a member of the faculty in 2010. Abramson investigates the molecular and cellular mechanisms that control the establishment of immunological tolerance, a process in which the immune system "learns" to recognize and tolerate the body's own components.

Science Festival

Some 10,000 participants showed up for the 11th annual Science Festival at the Weizmann Institute. This year's activities included circus performances, short talks by Institute students and researchers, and interactive stations in which visitors could see how a TV works, learn how cheese is made or recreate famous experiments. A special exhibit in the Clore Garden of Science featured amateur astronomy activities around the country. The Festival was organized by the Davidson Institute of Science Education, the educational arm of the Weizmann Institute, together with the municipality of Rehovot.

Sixth Annual Gruber Award to Dr. Tali Kimchi

Dr. Tali Kimchi

Dr. Tali Kimchi of the Neurobiology Department will receive the 2012 Gruber Award for Scientific Excellence, which funds the work of promising young scientists for a period of three years. The award, supported by the Peter and Patricia Gruber Foundation and part of the foundation's international Young Scientists Awards, has enabled five rising talents at the Weizmann Institute to develop research in a variety of fields, including neurobiology, particle physics, astrophysics and organic chemistry.

Kimchi's research is shedding new light on the class of biological factors known as pheromones. These small molecules play an important role in sexual attraction throughout the animal kingdom, including in humans. This attraction involves the production and secretion of pheromones in one animal, and their reception by the olfactory system of others and subsequent registry in these animal's brains, followed by a response. It is a complex system that is vital for the propagation of numerous species.

"Not only has the Gruber Award program enhanced our work on campus, but it is empowering a new generation of scientists to follow their dreams," said Weizmann Institute President Prof. Daniel Zajfman, who is responsible for selecting the annual winner.

Dr. Zohar Komargodski of the Department of Particle Physics and Astrophysics received the Gruber Award in 2011. Komargodski's research focuses on supersymmetry – a quantum field theory that may, in the future, help to explain all physical phenomena.

Visitors tour the grounds near the Koffler Accelerator

(l-r) Institute President Prof. Daniel Zajfman, Dr. Celia Zwillenberg and Dr. Kobi Abramson

Science Festival volunteers lead hands-on demonstrations

Lab in the Trees

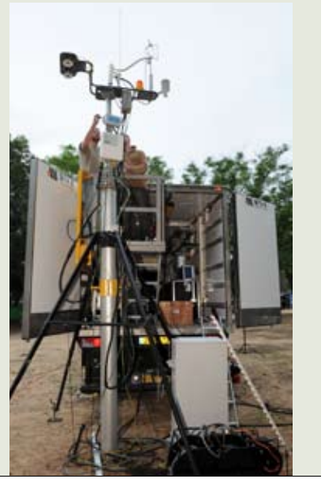
WHAT WE ARE DOING ABOUT
ENVIRONMENT & ENERGY

Since the days when the fifth president of the Weizmann Institute, Institute Prof. Israel Dostrovsky, initiated a solar energy research program, the Weizmann Institute has been a leader in alternative energy research. Around that time, Institute scientists were creating materials that would greatly improve the efficiency of solar collectors and laying the ground for today's Environmental Sciences and Energy Research Department. Today, research in these areas is expanding through internal growth in the department and unique collaborative projects with other departments.

Compared to the large forested tracts of Northern Europe or the rainy tropics, the Yatir Forest at the edge of the Negev desert is easy to dismiss. Planted by humans in the last century, it is composed almost entirely of one species of pine. Yet, for the past decade, this patch of trees has been a vital part of the global effort to understand and predict future climate change – one that might help scientists understand the implications of deforestation and afforestation, or the consequences of a drier, hotter world.

Since it was established in 2000, the Yatir research station has been a member of FLUXNET – a worldwide chain of such stations that gathers information on carbon dioxide, water and energy exchange of forest ecosystems around the world. The Institute's Prof. Dan Yakir and his team have operated the station since its beginning.

For the past decade, this patch of trees has been a vital part of the global effort to understand and predict future climate change



Telescopic mast in the mobile research lab enables scientists to take measurements in the forest canopy

Cool science, hot question

One of the more significant findings to come out of the Yatir station is that semi-arid forests like Yatir, which cover some 17% of the Earth's land area, can heat the Earth's surface at the same time as they cool it. Trees are known to counteract the greenhouse effect, thought to be responsible for warming the atmosphere, by absorbing carbon dioxide (CO_2) from the atmosphere. But Yakir and Dr. Eyal Rotenberg found that the forest's total energy budget includes deposits as well as withdrawals. For example, the trees' dark color means they absorb more of the sun's heat than the light scrubland or exposed soil nearby. In addition, these trees use a primitive "air conditioning" system that transfers heat through contact with the surrounding air instead of radiating it back out into space. Over time, the forest budget ends up in the "green," but first, a few decades of investment in surface heating is required. On this short-term time scale, deforestation might even have a cooling effect.

Yakir: "Overall, forests remain hugely important climate stabilizers (not to mention the other ecological services they provide), but there are tradeoffs, and we need to take these into consideration when predicting the future."

Forest research on the road

UK donor Robert Lewis first heard about Prof. Yakir's work at the Global Gathering in Chicago where Robert's mother Hilda and other members of the President's Circle of the American Committee of the Weizmann Institute of Science were honored. Among other things, Yakir described his plans for a mobile research lab. Robert, a classic car collector, and his sister Cathy Wills, a committed environmentalist, thought a gift to this lab would be a perfect match. The result is the Biosphere-Atmosphere Research Mobile Lab, which now enables Yakir and his team to monitor forests all over Israel, and beyond.

Lewis: "I know it would have been a real source of pride for my late father, Cecil, to know that Cathy and I are jointly supporting the cause of environmental research at the Weizmann Institute. I find it captivating to watch Prof. Yakir at work; it is a personal privilege to support scientific inquiry that is wholly to the benefit of our planet."

(l-r) Robert Lewis and Prof. Dan Yakir admire the Biosphere-Atmosphere Research Mobile Lab. Top: Yatir Forest

Down from the Clouds

Prof. Ilan Koren

Clouds and rain are two of the bigger question marks in models of global climate systems. We know that human activities affect them, but how? Clouds can cool the Earth's surface, but they also trap thermal radiation. Rain waters our crops and replenishes drinking water supplies, but torrential rains can bring disaster. Do the changes we make in the atmosphere cause these effects to become stronger, or do they lessen them? Rain-cloud systems are highly varied and the physics behind them extremely complex, so teasing out the added effects of human-induced atmospheric change is a real challenge.

One of Prof. Ilan Koren's ongoing investigations concerns the effects of aerosols – tiny particles afloat in the atmosphere – on clouds and rain. Natural and manmade aerosols provide "seeds" for the condensation of cloud droplets. What happens when burning fuels add tons of human-induced aerosols to the atmosphere?

A hard rain

In earlier research, Koren, working with Dr. Graham Feingold of the NOAA Earth System Research Laboratory, Colorado, had found that the addition of aerosols affects clouds in several ways: Clouds with excess aerosols are made of more, but smaller, droplets, and this, in turn, affects the clouds' shape and lifetime. Further research revealed that changes in the aerosol load can also affect the stability of a cloud system, abruptly shifting it into instability and back again.

In their most recent study, Koren, Feingold and their colleagues looked below the clouds, asking how aerosols affect rainfall. They began with several months' worth of satellite data that showed rainfall patterns around the globe. These data did not reflect total rainfall, but rather the rain rate – measured in millimeters of rain per second. Next, they looked at aerosol pollution levels and compared the two data sets. Their analysis showed that in most cases, more pollution was strongly tied to more intense rainfall. Further analysis suggested that this tie is not incidental – higher aerosol levels really do appear to cause rain to fall harder and faster.

Koren believes that the areas most affected by this phenomenon are those where rains are generally in the mid-to-heavy range, but not usually torrential. With aerosol pollution, the same amounts of water might fall, but in less time. As downpours become stronger, they pass the point at which the ground is able to absorb the rainwater. Runoff, plant damage and even flooding can ensue.

Their analysis showed that in most cases, more pollution was strongly tied to more intense rainfall

Wind Factors

Our atmosphere is just a gossamer coating on the Earth's wide surface. Yet the ten-kilometer-thick layer closest to us – so paper-thin in comparison with the rest of Earth that we can practically relate to it as two-dimensional – gives rise to amazingly complex phenomena such as gigantic wind systems.

Prof. Gregory Falkovich, a theoretical physicist in the Physics of Complex Systems Department, develops models to examine the factors and processes that generate these atmospheric phenomena. Recently, he had the opportunity to test one model in a controlled, experimental system – in the lab of Prof. Michael Shats of Australian National University, Canberra. There, the researchers observed what happens in a table-top, water-based system designed to mimic the thin, lower layer of the Earth's atmosphere.

Air can move both vertically and horizontally (creating the phenomenon we call wind). As diverse land areas absorb the sun's rays differently, areas of high and low pressure are created, and air flows from one to the other. The lab experiments supported the predictions of Falkovich's model. In a two-stage process, tiny vertical movements cause strong horizontal flow to eddy in a giant whirlpool. "Such whirlpools," says Falkovich, "can exist on a global scale of thousands of kilometers in diameter – so big they can only be measured by satellite." In the later stage, the horizontal whirlpool gradually sucks the energy from the small-scale vertical movements, depressing them while enlarging the extent of the horizontal flow.

Clean Dreams

Dr. Tareq Abu Hamed was a postdoctoral researcher at the Weizmann Institute in 2004, in the group of Prof. Jacob Karni. Working in the Canadian Institute for the Energies and Applied Research, he developed a new type of fuel cell in which hydrogen is extracted from water.

Abu Hamed's scientific path took him from Sur Baher, just outside East Jerusalem; to Turkey, where he completed his Ph.D. in chemical engineering; to the Weizmann Institute and then the University of Minnesota for continuing research on alternative energy. A great believer in the power of science to bridge cultural, social and political gaps, Abu Hamed has sought out positions in Israel that enable him to actively work to build those bridges. At the Institute, he organized tours of the Clore Garden of Science on the Weizmann campus for Palestinian children attending summer programs in his village. Hoping to be a positive role model for the children and their teachers, he accompanied the groups, explaining in Arabic the scientific principles involved in the Garden's interactive exhibits. Today, he is Director of the Center for Renewable Energy and Energy Conservation at the Arava Institute for Environmental Studies, in Israel's arid south, as well as a researcher at the Dead Sea and Arava Science Center. There, among other things, he is continuing to work on his dream of clean, efficient hydrogen fuel cells.

Dr. Tareq Abu Hamed, daughter Ilia and wife Sukina

Hydrogen on demand

Five kg (11 lbs) of hydrogen is sufficient to fuel an average car for 500 km (311 mi), and there are no CO_2 emissions. The catch is in storing the reactive hydrogen gas safely and efficiently inside the car. In the fuel cell Abu Hamed began developing at the Institute, hydrogen is produced as needed, doing away with the need for storage. Boron – a lightweight, semi-metallic element – and water are held separately and mixed in a controlled manner. The result is an on-the-spot chemical reaction that produces hydrogen and boron oxide; the latter can be repurified in a process powered by solar energy. If this technology can be successfully adapted for use in vehicles, it might help overcome several hurdles of today's hydrogen technology: The hydrogen need not be stored onboard, but rather produced as needed; and there is practically no waste.

If this technology can be successfully adapted for use in vehicles, it might help overcome several hurdles of today's hydrogen technology

Electricity in the air

The firm HelioFocus is constructing an experimental facility to test cutting-edge solar technology that will generate electricity from warm air. The HelioBooster, based on Weizmann Institute research, is licensed to the firm by Yeda Research and Development, Ltd., which advances the industrial and commercial application of Weizmann Institute discoveries.

The facility will be a part of the Rotem Innovation Center for Renewable Energy Technologies, the technological arm of the nuclear research complex in Dimona. It will rise to a height of 35 meters (115 ft) and cover an area of five dunam (about 1¼ acres). A mirrored dish 30 meters (almost 100 ft) across will enable the efficient absorption and concentration of heat through an air solar receiver.

The Center's researchers hope to demonstrate that this setup will be much more economical in land use than other thermo-solar devices. The principle advantages of the system are that it works at extremely high temperatures, it can produce more heat per square meter than other solar facilities and its modular design allows to be scaled up as needed.

The HelioBooster under construction in the Negev Desert

New

David Lopatie Conference Centre

Opens its Doors

The Weizmann Institute formally opened the new David Lopatie Conference Centre in a gala event on Nov. 13 honoring its South African donor. The Centre was heralded a future venue for international scientific conferences that will shine a spotlight on the Institute and its cutting-edge research.

Located prominently at the campus entrance, the Centre represents the renovation and transformation of the former Wix Library into a state-of-the-art facility that will also host meetings of the International and Executive Board, the Scientific Council, the Council of Professors, and Promotion committees. In addition, it will be the new home of the Barbara Levinson Visitors Center and the offices of the Academic Secretariat.

In an interview, Mr. Lopatie said: "What appealed to me most was to leave behind some structure – that was just my personal view and wish." He also made a major gift to support the Crossroads of Science Fund, which will seed conferences at the facility, including annual conferences named for the supporting donor.

The Centre's main meeting space is Helen L. and Martin S. Kimmel Hall, which was also dedicated on Nov. 13.

"In this era of globalization, global networking is as essential in academia as in business," said President Prof. Daniel Zajfman at the dedication of the Lopatie Centre. "Thus, a high priority for the Weizmann Institute of Science – and for Israel – is to increase the number of foreign visitors from the international scientific community, and thereby provide greater exposure to Weizmann and Israeli science. We are at a disadvantage because we are located far away from the large intellectual centers. There's not much we can do about Israel's geographical and political isolation, but we can create – and have created – a world-class center on campus for international conferences."

> ***"What appealed to me most was to leave behind some structure – that was just my personal view and wish."***
> ***—David Lopatie***

The refurbished Visitors Center in the Lopatie building, said Zajfman, "is an exciting new element that, I believe, will enable it to rival even the science museums in the country by making science come alive in a user-friendly way for adults and children alike. It will also show in an unprecedented way how Weizmann science has contributed to understanding of health and disease," said Zajfman.

David Lopatie in front of the new David Lopatie Conference Centre

David Lopatie was born in Johannesburg and spent his childhood in South Africa's northern Transvaal, bordering Rhodesia, where his father ran a hotel. He and sister, who died in 2001, were schooled in Johannesburg.

"We were conscious of being Jews, but we were not part of the Jewish community – we were far from it," he recalled.

His father was born in Lithuania, and his mother in England. After graduating from university, David led a successful career as an accountant. Having lived through World War II and apartheid in South Africa, he said he was always keenly interested in politics and global affairs, so newspapers have been a constant companion. He retired to London in 1984, where he lived for 25 years.

He relished his years spent in London, soaking up the arts and history and enjoying a wide circle of friends. London was the ideal playground to explore his intellectual curiosity, he said, because he always "saw history through the lens of the British Empire," which originated in his mother's love of England from her childhood. But he outlived many of his London friends, and in 2010 returned to his native South Africa.

He has supported a professorial chair in post-Holocaust studies at Ben-Gurion University and the expansion of the university's library. In making his gift for the establishment of the David Lopatie Conference Centre on the Weizmann campus, he said a major factor was his appreciation for the Sieff family, longtime friends and supporters of the Institute and fellow Londoners. The Sieff family's original gift in 1934 established the Daniel Sieff Research Institute, which later became the Weizmann Institute.

Teaching the Teachers

The first 26 graduates of the Rothschild-Weizmann Program for Excellence in Science Teaching at the Weizmann Institute of Science took the stage in caps and gowns on Nov. 13 for a commencement ceremony conferring M.Sc. degrees on science and math high school teachers from all over Israel. The graduates participated in the prestigious, demanding three-year program, which is funded by the Rothschild-Caesarea Foundation, in parallel to their regular teaching duties.

Unique in Israel, the Rothschild-Weizmann Program, launched in 2008, is a continuing education project that deepens and broadens teachers' scientific knowledge, familiarizes them with the newest approaches to science education, exposes them to research in science teaching, and provides them with experience in creating and leading original initiatives in the education field. The program is expected to create an elite corps of science teachers who will serve as ambassadors in their own schools and communities for raising the level of science teaching and lead the way in transforming science teaching in Israel.

"The program was designed to provide you with tools to become better teachers to your students, making them, in turn, better students, better decision-makers, and ultimately, better citizens," President Prof. Daniel Zajfman told the graduates in his address at the ceremony.

Administered through the Feinberg Graduate School, the program is headed by Prof. Shimon Levit of the Faculty of Physics and Prof. Bat Sheva Eylon, Head of the Science Teaching Department.

Baroness Ariane de Rothschild, whose husband Baron Benjamin de Rothschild heads the Rothschild-Caesarea Foundation, described the enthusiasm with which her family provides the program's support.

In her keynote address, Nobel laureate Prof. Ada Yonath disclosed that she herself has a teaching certificate, and she emphasized the major role of good teachers in the lives of their students, saying that she was lucky to have had such teachers in her own life. Prof. Yonath said a good teacher "nurtures curiosity" among his or her students and finds a way to engage each student according to what most appeals to him or her."

Ruti Hanan, a physics teacher from the Jordan Valley, spoke on behalf of the graduates, describing the program's special atmosphere and voicing the hope that its spirit of excellence will resonate in schools. "Without the support of the Rothschild-Caesarea Foundation we would not be here today," she said.

Feinberg Graduate School Dean Prof. Lia Addadi addresses the first Rothschild-Weizmann graduating class

The Nexus of Science and Humanities: the Next Frontier

The new Braginsky Center for the Interface between Science and the Humanities will be a bridge between the Weizmann Institute's traditional science focus and the broader context of science in society, said President Prof. Daniel Zajfman at the special International Board session inaugurating the new center. "The next frontier of science will be the interface between science and the humanities, because if we want science to benefit humanity and solve some of society's biggest challenges, we must ensure that scientists have the opportunity to work collaboratively with experts in the humanities."

(l-r) René, Susanne, Sharon and David Braginsky, and Prof. Daniel Zajfman.

"We have witnessed the passion of Weizmann scientists and students; their belief in a better future; their brains and Israeli 'can-do' attitude. We are proud and delighted to make a contribution," said René Braginsky, past chairman of the Swiss Friends of the Weizmann Institute of Science who, with his wife Susanne, is funding the center. "In these difficult economic times, it is especially important to support science and education, as governments – from Israel to Switzerland – are less in a position to do so than they once were," he told his fellow International Board members and guests.

The Braginsky Center, headed by Prof. Itamar Procaccia of the Chemical Physics Department, will seed joint research projects between Institute scientists and academics in the behavioral and social sciences from outside the Institute. The center will enhance the impact of the scientific work at the Institute by enabling collaboration between the hard sciences and fields including archaeology, psychology, economics, climate and the environment, and more. The Helen and Martin Kimmel Center for Archaeological Science, established in 1996, has already utilized knowledge in carbon dating and materials science to shed new light on archaeology and thus history.

"I see this as a declaration of a fundamental change in the way the Weizmann Institute sees scientific research," said Procaccia. Religion, philosophy, the arts and science all claim to be interpreters of humanity, he said, but "they have diverged enormously over the years. My dream is that this center will enable us to begin to ask how to reduce the divisions and bring them closer together, and to develop a new laboratory for the study of humans and human interactions."

Dame Vivien Duffield

Clore Luncheon

At the presentation of the 21st annual Charles Clore Prize for Research, Dame Vivien Duffield said that despite news headlines about social unrest in Israel and nuclear threats from Iran, this trip to Israel with trustees of the Clore Israel Foundation was "the most stimulating and enjoyable visit yet. There are dedicated people at the Weizmann Institute who are achieving marvelous things," she said at the prize ceremony during the November meetings of the International and Executive Board of the Weizmann Institute.

Dame Vivien presented the Charles Clore Prize for Research to Dr. Itay Halevy, a planetary geologist who recently joined the Environmental Sciences and Energy Research Department. The prize is given to the most promising young scientist recruited to the faculty. He described how his interest in geology, kindled during his army service in the Negev and nurtured at Ben-Gurion University, turned to planetary geology when one of his insights helped solve a climate riddle about Mars. Addressing the audience, he said that he looks forward to tackling the many fascinating, fundamental and still unsolved problems in the field.

Dame Vivien also awarded Clore Postdoctoral Fellowships to ten young postdoctoral researchers from the Weizmann Institute. After carrying the philanthropic torch of the UK-based Clore family for many years and underwriting scholarships in Israel at many levels, Dame Vivien said she was delighted that there are now "many Clore scholars around the country, all of them doing excellent science."

The keynote speaker, Israeli journalist and TV commentator on Arab affairs, Zvi Yehezkeli, told the group that there is "no Arab Spring" – at least not yet, and that the Middle East situation remains "foggy" at best. Yehezkeli recapped many of the underlying conflicts in the Arab world – Shiite versus Sunni, old guard versus new, sectarian and tribal rivalries. "There are many internal struggles that have been around a very long time," he said, "a true Arab Spring may yet take some time."

Honorary Ph.D.'s to **Six Citizens** of the World

Honorary doctorate ceremony

(l-r) Top: Martin Paisner, Murray Perahia and Prof. Alexander Pines. Bottom: Baroness Ariane de Rothschild, Prof. Klaus von Klitzing and Chava Alberstein

Children are born with innate curiosity that compels them to ask questions about the world around them, but this curiosity often dissipates in adults, said Israeli singer and icon Chava Alberstein upon receiving an honorary Ph.D. at the Weizmann Institute on Nov. 14. "In the Weizmann Institute, the scientists never grow up – they keep asking questions," she said.

Alberstein was one of the six recipients of a Doctor of Philosophy *honoris causa* degree at the annual conferment ceremony. She charmed the audience with a song to kick off the evening. It was an altogether highly musical evening, with renowned concert pianist Murray Perahia, who also received an honorary Ph.D., playing a piece. Other recipients were Prof. Klaus von Klitzing, Martin D. Paisner, CBE, Prof. Alexander Pines, and Baroness Ariane de Rothschild.

"If one is blessed with imagination and the capacity to dream, it is difficult not to be excited by science," said Paisner in his remarks.

Each of the recipients of the degree is a virtuoso in his or her own right, who, in addition to their own personal achievements, has made remarkable contributions to the world in which we live. "They are each superbly accomplished in their own fields, but there is a clear common thread among them: their commitment to education and their understanding of the critical importance of instilling knowledge in the next generation," said President Prof. Daniel Zajfman at the ceremony. "This is clearly one of the Weizmann Institute's central values, and therefore you can see why I consider this group of recipients part of the extended Weizmann family."

Chava Alberstein is a singer, lyricist, composer, and musical arranger who has enriched Israel's cultural life for more than 40 years. In addition to her vast repertoire of Israeli music in Hebrew, including children's songs, she is also renowned as an interpreter of Yiddish songs; and she has played a pivotal role in helping to revive Yiddish music as part of the cultural heritage of Israel and the Jewish people. She is also an outspoken champion of liberal causes and a human rights activist.

Prof. Klaus von Klitzing is a German scientist known for the discovery of the integer quantum Hall effect, for which he was awarded the 1985 Nobel Prize in Physics. In addition, he has set a new standard of electrical resistance, expressed in the von Klitzing constant, thereby enhancing the precision with which scientists can study the conducting properties of electronic components. His illuminating investigations have helped clarify many of the outstanding issues in solid state physics, and his warm ties with Israel and his decades-long friendship with the Weizmann Institute have yielded extensive and fruitful collaborations with Institute colleagues in the field of quantum solid state physics.

Martin Paisner is a highly respected member of the legal establishment in the UK who has combined an extraordinarily successful career in law with a life of public service. His distinguished record of personal dedication and community service extends to a varied range of social, medical and cultural causes; his deep concern for the Jewish people and the State of Israel is evident through his long-standing commitment of time, energy, enthusiasm and leadership to the Weizmann Institute of Science and the cause of scientific excellence.

Murray Perahia is celebrated both as a great musician and a musical educator. He is one of the most cherished concert pianists of our time who, during the course of his career spanning more than 45 years, has performed in all major international music centers and with all the world's leading orchestras and ensembles. He is an ardent supporter of musical education. In an outstanding contribution to music culture in Israel as President of the Jerusalem Music Center and as a gifted teacher, Perahia nurtured the talent of promising young Israeli musicians and propagated classical music education among the nation's youth.

Prof. Alexander Pines is a world leader in the advancement of nuclear magnetic resonance spectroscopy whose insights have had a major impact on a breadth of fields ranging from materials science to medicine. As a teacher extraordinaire and mentor, he has had a profound impact on the formation of a whole generation of scientists. His commitment to the advancement of scientific research in Israel is reflected in his long-standing association with the Weizmann Institute of Science as an esteemed colleague and active member of its International Board.

Baroness Ariane de Rothschild is an international businesswoman who is recognized for her innovation in the worlds of commerce, banking and finance, in which she blazed a trail of greater opportunity for women through her personal example and creative initiatives. Her desire to advance social responsibility is evident in her leadership of the Rothschild-Caesarea Foundation. Her warm support of the Rothschild-Weizmann Program for Excellence in Science Teaching at the Weizmann Institute of Science sets ambitious new standards and goals for science education in Israel.

In her keynote speech, she said, "This outstanding institution has demonstrated since its creation in 1934 a truly unique dedication to scientific excellence and social responsibility. Yet it is not an ivory tower. It nourishes an extraordinary community of teachers and students and reaches out to society at large."

Tova and Sami Sagol

Nancy Eckhous

Prof. Manuel Trajtenberg

Surfing Science: The Launch of Davidson Online

Thanks to a transformational gift by Tova and Sami Sagol, the Davidson Institute of Science Education at the Weizmann Institute is launching a new interactive science education web site in Hebrew: Davidson Online, geared toward Israeli junior high and high school students and the general public interested in science and technology. The site was officially dedicated on Nov. 16 in the presence of Sami and Tova Sagol.

Davidson Online is part of the Davidson Institute's broad outreach to advance science literacy among school-aged children and the public as a whole, and the Sagols' gift thus helps advance the Institute's agenda of science literacy for the public.

"We need to truly understand science in order to be a true citizen of the state," said Weizmann Institute President Prof. Daniel Zajfman at the event. "Democracy isn't just about putting a ballot in a box – it's about making informed decisions. It's not just about transmitting science information. It's about creating and nurturing curious minds and thus creating a passionate culture of intellectual exchange and problem-solving."

Part of the impetus for the new site was the traffic on the existing site – about 75,000 unique visitors every month – a sign that there is a growing demand for online science information and instruction to supplement classroom teaching. The Sagols' gift is enabling the creation of a more technologically advanced site that will feature a variety of age-appropriate science activities in a breadth of disciplines, all designed to ignite curiosity and scientific thinking. Future plans call for a parallel English language site, so the Davison Online activities will have worldwide appeal.

Content is developed by Weizmann scientists, doctoral and masters' students, and Davidson Institute's staff and experts in science and science education, or brought by them from other, verified scientific databases.

A Scientist's Gift to Science

A special ceremony held on Nov. 15 marked the inauguration of two initiatives made possible by Dr. Bruce A. Pearlman, a highly dedicated and successful synthetic organic chemist from Detroit, Michigan, who died in 2009. His family honored his memory with gifts to the Weizmann Institute of Science to establish the Dr. Bruce A. Pearlman Professorial Chair in Synthetic Organic Chemistry, whose first incumbent is Prof. Milko van der Boom of the Organic Chemistry Department; and the Dr. Bruce A. Pearlman Program for Outstanding Students in Organic Chemistry.

The Program for Outstanding Students realizes Dr. Pearlman's vision of helping the State of Israel, said his sister Nancy Eckhous, by enabling the brightest organic chemistry students to receive top-notch training and provide them with the intellectual and financial support they need to excel.

President Prof. Daniel Zajfman, who had met Pearlman both in Detroit and in Rehovot, said: "Bruce was a real scientist – passionate about what he was doing and worried that not enough people understand the true value of organic chemistry to society." Prof. Zajfman also noted that Organic Chemistry is the only department at the Weizmann Institute whose name has not changed since its inception – testament to its centrality to the understanding of basic science.

In describing her late brother, Eckhous depicted an ardent scientist whose all-encompassing commitment to and love of his profession, and meaningful contributions to organic process chemistry, made his family proud. Eckhous, together with sister-in-law Susan Pearlman and nephew, Mark Pearlman, presented van der Boom with a bound volume of the collected papers and patents of Dr. Bruce Pearlman.

Israeli Higher Education Poised for Better Future

Prof. Manuel Trajtenberg is best known to Israelis as the man who headed the independent committee on social justice, which recently presented a series of recommendations to the government. In this role, he many have had the distinction of being one of a very few to earn the trust of government and protesters, alike.

When he spoke to Weizmann Institute supporters and members of the Institute's Executive and International Board in a special session on Nov. 16, however, he was wearing a different hat. As chairman of the Council for Higher Education's Planning and Budgeting Committee (PBC) and a professor of economics at Tel Aviv University, Trajtenberg talked about the past decade of decline in the higher education budget and a worsening of the brain drain, as well as a creative plan he has been implementing to stem the tide.

President Prof. Daniel Zajfman praised his work at the PBC, saying that, "Prof. Trajtenberg took over the PBC at its lowest point and in just one year turned it into a working institution."

In his talk, Trajtenberg cited several statistics: Israel now has the highest percentage of academics in faculty positions in the US – 25 % of Israeli academics – as compared to other countries; 6,000 Israelis hold faculty positions in Israel and an additional 1,500 Israelis hold faculty positions in the US. These figures encapsulate the strengths and weaknesses of Israeli academia. In the years between 2000 and 2009, which Trajtenberg called the "lost decade," student numbers continued to rise at the fastest rate recorded in the OECD. On the other hand, budgets stayed flat or declined, infrastructure and equipment became outdated and universities were largely unable to recruit new members, causing the shrinking and aging of faculties. These, compounded with allocations of higher education money to new colleges, fueled the ensuing brain drain.

The implementation of the PBC's multi-year plan for investment in Israeli higher education, launched when Trajtenberg took office in 2009, includes increased budgets for universities, the creation of more faculty positions and recruiting Israeli faculty from abroad, attracting minorities and the ultra-Orthodox, and reducing the student-to-faculty ratio. "I believe that with this plan, we can go back to the times when Israeli higher education was not about quantity, but about excellence and quality," he said.

According to Trajtenberg, the Weizmann Institute is the "crown jewel" of the Israeli education system: It maintains high standards of excellence, is successful in recruiting Israelis to faculty positions and, last but not least, it receives significant philanthropic funding. Speaking directly to Weizmann donors and Board members, he said: "You are supporting Israeli science, which means you are supporting Israeli society, because brain power is the only resource we can rely on."

Science on Tap

Is cutting-edge science easier to swallow when it's served with beer and a snack? For the fourth time, Weizmann Institute scientists took over dozens of bars, coffee shops and restaurants in Tel Aviv to deliver popular lectures on their favorite scientific subjects. This year's event paid special tribute to the Technion and to Prof. Dan Shechtman, 2011 Nobel laureate in chemistry. The Technion's Prof. Gitti Frey, a former student of the Institute's Prof. Reshef Tenne in the field of nanoscience, was a guest speaker.

On a Facebook event page created especially for Science on Tap, people responded enthusiastically before and after the event:
... cool, great pubs and great topics, Can't wait!
... It was fascinating. I heard a talk on the nose as a means of communication, how it is possible through inhaling and exhaling to steer a wheelchair, and the wonders of the sense of smell. In short, there is a whole world in one nose. Kudos, I can't wait for next time.
... If I get myself into superposition, does that mean I can attend all the lectures?
... Please, please, please make this a regular event – weekly monthly – whatever!
... The lecture by Dr. Alon Chen was excellent!!! He managed to speak on a complex subject – "the genetics of anxiety, stress, obesity and social behavior" in a simple, clear manner. And he generously answered all questions while keeping to the point for the whole lecture! Thanks also to Landwer Coffeeshop for the perfect hosting, it was worth it! :-)

Nano Comics

The Nano Comics began as a series in the Weizmann Institute publications, *Hamachon* and *Interface*, to highlight Institute research in a fun format. Then, they were collected in a comic book format and turned into posters. Nano Comics made an appearance at the Animax International Animation, Comics and Caricature Festival held in Tel Aviv in August. In the Nano Comics workshops, scientists and illustrators worked together with children, helping them to create their own science comics. Lately, Nano Comics have been showing up all over the country. A Nano Comics workshop was held at the Rosh Pina Film Festival in northern Israel, and Nano Comics posters have been donated to a number of high schools.

Lights and Colors

On the last night of the Hanukkah holiday, 16 Feinberg Graduate School students appeared in the pediatrics ward of Kaplan Medical Center in Rehovot laden with boxes of traditional jelly donuts, song books, special "scientific" Hanukkah menorahs and lots of good will.

After the children and their parents enjoyed a Hanukkah sing-along, they went to light the menorahs – a surprise prepared for them by the students. The menorahs consisted of nine bowls, each containing a different chemical salt. The children crushed the salts in the bowls, added a few drops of ethanol, and lit the mixtures. To their surprise and delight, the "candles" burned in different colors. Afterward, they received a short explanation on why the salts give the flames different colors and how one can identify various compounds by looking at their color when they burn. The activity ended with the jelly donuts for all and, of course, more singing.

Michal Sevilla, the evening's organizer, said: "There is nothing more touching and satisfying than stepping out of one's day-to-day problems and bringing light to children whose troubles dwarf those we see in our everyday lives."

Groundswell **of Support** from **Canadian Friends**

The Canadian footprint on the Weizmann Institute campus is growing ever larger.

Canadian donors have historically played a role in the development of the campus infrastructure and advancement of research, notably in the field of alternative energy. The Canadian Institute for the Energies and Applied Research, established in 1985 and one of the most sophisticated solar research facilities in the world, was a community-wide philanthropic effort that seeded solar research, enabling the construction of a solar tower and a solar energy research field.

Another flagship initiative by Canadian donors is the Mary and Tom Beck Canadian Center for Alternative Energy Research, representing a major investment from one of the closest Canadian friends of the Institute. Cathy Beck now carries her parents' torch as president of Weizmann Canada, working hand-in-hand with National Executive Vice President Susan Stern – a partnership that Mrs. Stern calls "a key ingredient" to the committee's success.

In recent years, Weizmann Canada has dramatically widened its circle of friends – often in creative ways that have resulted in an outpouring of support for the Weizmann Institute in a breadth of scientific disciplines.

Through the newly established Canadian Fund for Scientific Excellence, for instance, individual donors chose to support a lab or, in three cases, a group of Canadians came together to support a lab in honor of three distinguished members of their community, for a total of nine labs:

Anonymous Donor Laboratory for Research in Plant Science
(Dr. Assaf Vardi)
Dr. Syndey Brenner Laboratory for Research in Molecular Biology
(Dr. Eran Hornstein)
Marianne Manoville Beck Laboratory for Research in Neurobiology in honour of her parents Elisabeth and Miksa Manoville
(Prof. Ilan Lampl)
Miles and Kelly Nadal and Family Laboratory for Research in Molecular Genetics
(Prof. Jeffrey Gerst)
Lorna Greenberg Scherzer Laboratory for Research in Molecular Genetics
(Prof. Naama Barkai)
Marvin Tanner Laboratory for Research on Cancer
(Prof. Yosef Yarden)
Jay Smith and Laura Rapp Laboratory for Research in the Physics of Complex Systems
(Dr. Nirit Dudovich)
Dr. Lou Siminovich Laboratory for Research in Neurobiology
(Prof. Rafael Malach)
Sharon Zuckerman Laboratory for Research in Systems Biology
(Prof. Yitzhak Pilpel)

"What is so unique about this fund, and what I believe has led to its great success, is the that supporters are able to select a lab from among a wide range of research areas, from genetics to plant sciences, and from alternative energy to advanced physics. In other words, it's the donor's pick, which really enables the best possible match between donor and scientific area," said Prof. Daniel Zajfman at the Nov. 16 luncheon and dedication of several of the labs.

The biggest gift from a Canadian donor in 2011 came from David and Stephanie Azrieli and the Azrieli Foundation, for the establishment of the Azrieli Institute for Systems Biology. In describing the family's reasons behind its generous donation, daughter Dr. Naomi Azrieli, Executive Director of the Foundation and Chair of its Board of Directors said, "We are particularly attracted by the cutting-edge, interdisciplinary and holistic approach of the field, which is truly one of the most exciting in science today. Together, the Azrieli Foundation and Weizmann can help bring the field of systems biology to a whole new level."

Other significant gifts in 2011 included the establishment of the Lorna Greenberg Scherzer Professorial Chair, whose first incumbent is Prof. Naama Barkai. Two gala events, in Toronto and Montreal, raised millions of dollars for scientific research.

Greenberg Scherzer called the creation of the lab and professorial chair in her name "the most satisfying moment of my life."

Citing the long-time support of friends, including Marvelle and Murray Koffler and Sharon Zuckerman, among others, Prof. Zajfman said that the expansion of the Weizmann Canada circle "was made possible by the strong roots that have grounded us."

Cathy Beck, President, Weizmann Canada

Dr. Nirit Dudovich and Dr. Jay A. Smith, Chairman, Weizmann Canada

SCIENCE & SAVOIR FAIRE!

WEIZMANN GLOBAL GATHERING

MAY 6-9, 2012 - MONTREAL, QUEBEC

Weizmann Global Gathering, May 6-9, 2012

In early May, the international family of Weizmann scientists, supporters, and friends will come together in Montreal for the biannual Weizmann Global Gathering. The two-and-a-half-day event includes three evenings of celebration, beginning with a red carpet event at the elegant Windsor Hotel ballroom to recognize donors from around the world who are being inducted into the President's Circle. The Global Gathering will feature scientific presentations on topics including personalized medicine and sustainability. In addition, there will be walking and culinary tours through the city; intimate cocktail parties in the homes of well-known Montrealers; and a closing dinner at the Chalet du Mont Royal, which will also celebrate David Azrieli's 90th birthday.

Scientists who will be present include Prof. Zvi Livneh, Biological Chemistry; Prof. Doron Lancet, Molecular Genetics; Dr. Jacob Hanna, MD, Molecular Genetics; Prof. Oded Aharonson, Environmental Sciences and Energy Research; and Dr. Ron Milo, Plant Sciences.

Join us! For more information go to: www.weizmann.ca/2012

The Archaeology of the Unseen

Prof. Stephen Weiner

On-Site Chemistry

Megiddo, Ashkelon and Gath are all described in the Bible. But who really lived there, and when? What was life like in the different periods of their existence? Archaeologists traditionally piece together answers from a variety of materials, including pottery, bones, walls and much more.

In recent years, however, Israeli archaeology has seen something of a revolution. From Megiddo in the north to Ashkelon and Tel es Safi (the biblical Gath) in the south, Weizmann Institute scientists have been taking part in archaeological digs. "You could call what we do the 'archaeology of the unseen'," says Prof. Stephen Weiner, incumbent of the Dr. Walter and Dr. Trude Borchardt Professorial Chair in Structural Biology, who is head of the Helen and Martin Kimmel Center for Archaeological Science. In addition to shovels and sieves, scientific equipment such as an infrared spectrometer goes into the field with the scientists. This is used to identify invisible chemical signatures in minuscule bits of material, revealing for instance, whether a layer of tiny calcite flakes in the sediments is the remains of a cooking hearth or a mud brick enclosure. When this analysis is an ongoing part of the process, questions can be answered as the dig proceeds and the excavation team can get real-time information on what they're seeing and what to look for.

One of the biggest advances, says Weiner, is in radiocarbon dating. Rather than simply receiving samples to analyze in the Weizmann Institute's radiocarbon lab, Dr. Elisabetta Boaretto begins the dating process on site. This allows her not only to get to know the exact context in which the artifacts are buried; it enables her to choose the materials that are most likely to yield reliable dates. She then conducts a careful material analysis of the samples before preparing them for the carbon dating process. Today, samples are sent abroad for radiocarbon dating, but a new accelerator-mass spectrometer – the gift of Dr. Naim Dangoor, CBE, of London, founder and head of the Exilarch's Foundation – that will be installed at the Institute in the upcoming year will enable the dating to be done on campus. This integrative approach to radiocarbon dating, says Weiner, increases the precision and reliability of carbon dating to the point that it could make such other methods as pottery style comparison redundant.

Megiddo, Ashkelon and Gath are all described in the Bible. But who really lived there, and when?

New Partners

The Weizmann Institute's record in pioneering scientific methods of archaeological research has led to a new scientific partnership that is now being formed with the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany. That partnership will initially involve two areas of research. In the first, scientists from the two institutes will continue to explore new methods and uses of radiocarbon dating.

The second will take Institute researchers into the realm of physical anthropology – the study of hominid fossils. Ironically, this area of research will make use of Weiner's modern field of expertise – that of understanding the structures and functions of such body parts as teeth and bone. For instance, Weiner and his team in his structural biology lab have been exploring how human teeth interact with the jawbone in a way that grants them a bit of give in certain directions during chewing. They found specific contact points where the teeth meet the bone, which the team characterized and mapped out. Now, the scientists in the collaboration want to look at fossilized teeth from hominids to see if they can identify those points and thus learn something about the dietary habits of our prehistoric ancestors and the evolution of human teeth and jaws.

Scientific equipment in the field

The Future Green Revolution

Dr. Avi Perl, Chief Scientist of the Ministry of Agriculture, Ph.D., Plant Sciences, 1986

"When my son was considering his options for graduate studies in science, I said to him: 'There's nothing to think over. The Weizmann Institute is the only place that will enable you to immerse yourself in basic research. There, they will make it easy for you to sprint ahead and follow your curiosity to new heights.'"

Dr. Avi Perl was born in Haifa, and grew up in the city. But his mother, a teacher, would take him on field trips to the nearby Carmel forests and countryside. From her, he learned to identify the flowers, plants and trees; the love of nature he shared with her would eventually lead him into plant science.

"I got to Weizmann through a want ad: Prof. Jonathan Gressel, who would later win the Israel Prize, was looking for lab workers. For three years, I worked in his lab inserting various genes for pesticide resistance into potatoes.

"That is how I got to know Prof. Ezra Galun. He offered me a Ph.D. position to investigate ways of sprouting potato plants from seeds, rather than tubers. Growing potatoes with viable seeds enables farmers to use all of the tubers – the edible part of the plant – for food, which is especially important in poor countries."

Good harvest

Perl's next stop was the Volcani Institute for Agricultural Research, where he filled a number of positions. His biotechnology research there focused on improving varieties of tomatoes, figs, pears, aloe vera and – heading the list – several types of seedless grapes. He recently received a lifetime achievement award for these developments.

"Over the years," says Perl, "I have stayed in touch with Institute scientists. We still collaborate, meet to exchange ideas and enthuse as though we were still young students. We are still riding that wave of curiosity in the hopes of attaining new knowledge or gaining new insights into the world of plants."

Feeding the world

Perl is all too aware of the challenges awaiting him at the Ministry of Agriculture. "We are heading toward a global food crisis," he says. "According to the official OECD projection, only 18 years from now – in 2030 – the world population will reach 10 billion. Half of those will lack sufficient food and water. This is a challenge of unprecedented dimensions, and I believe that the solution will lie in biotechnology. This next green revolution will require vision and hard work, which is why I'm sure that Weizmann scientists will play an important role."

Back to Perl's son, Ofer: After his father's recommendation, there was no point in further deliberation. Insisting on his right to rebel, however, he chose to study brain research in the Weizmann lab of Prof. Noam Sobel. (See p.19 for more on Sobel.)

Dr. Avi Perl in the lab...

and in the vineyard

Preparing to Start Up

Rina Shainski, general partner, Carmel Ventures, M.Sc., Computer Science and Applied Mathematics, 1983

Rina Shainski says her experience under the guidance of her thesis advisor, Prof. Adi Shamir of the Computer Science and Applied Mathematics Department, helped set her on a career path creating cutting-edge software products and bringing novel technologies to the global marketplace. She is now helping to create an Israeli "ecosystem" of venture capital-backed startups that nurtures success in high-tech industries.

At Weizmann, she focused on cryptography. Her broad computer science background, with recognition of Prof. Shamir's name in the field, clinched her first job in Silicon Valley in 1983, just two months after graduating from Weizmann, at Daisy Systems, an early software pioneer.

Rina had the luck, she says, of living and working in Silicon Valley in the 1980s, when the computer era was transitioning from infancy to adulthood. "I learned what it meant to have an ecosystem that enables the best technology to be built," she says. "Israel has successfully recreated this ecosystem. We now have entrepreneurs with innovative ideas and a seasoned grasp on executing."

During the 1990s, Shainski was vice president of business development at Clal Industries, one of Israel's largest investment and holding companies, following R&D and business development management positions at Tecnomatix, now owned by Siemens AG. In 2000, she joined Carmel Ventures, which manages $600 million in three funds and is considered one of the leading VCs in Israel. She is responsible at any given time for a handful of companies, and her focus is digital media and mobile applications. In her most recent success story, in 2011 she helped usher an Israeli start-up called Snaptu to an acquisition by Facebook. Snaptu's mobile application creates a user-friendly Internet experience on the most basic data-capable cell phones – a boon to millions of users, particularly in the developing world.

Shainski thinks that Israeli high-tech is ripe for even bigger success

Shainski thinks that Israeli high-tech is ripe for even bigger success, with billion-dollar "exits" or IPOs soon to overshadow those in the hundreds of millions seen today. "This will take the Israeli venture capital industry to a new level, and I'm convinced it will happen in the next few years."

With the new developments in the fields of information technology and communications, successful start-ups need employees with advanced degrees in computer science and math. Academia has the added challenge of keeping up with needs in industry in order to train graduates for challenges in the real world, which means strengthening lines of communication between industry and academia, she adds.

To identify the best hires and learn about the latest research, she feels it is very important to network among other alumni of the Weizmann Institute, which is why Shainski participated in last September's alumni event for the Computer Science and Applied Mathematics Department. In everyday work life, she says, "When I hear that someone is a graduate of the Weizmann Institute, we immediately have an instant connection that we can build on."

Rina Shainski

Alumni: Rina Shainski, Dr. Ella Amitay-Sadovsky

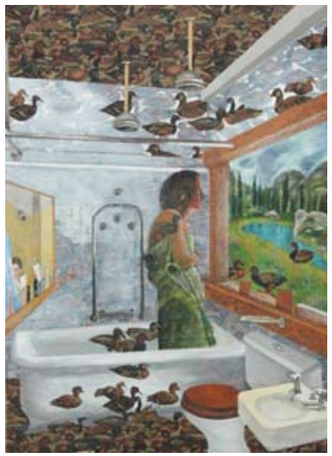
Dr. Ella Amitay-Sadovsky

The Big Picture

Dr. Ella Amitay-Sadovsky left science and a research position at the Hebrew University of Jerusalem for a career in art – ultimately deciding she preferred the personal pursuit of the "big picture" to the analytical pursuit of solutions to nanometer-sized polymeric molecules. Now, she uses her knowledge of chemistry, obtained in her doctoral research in the lab of Prof. Daniel Wagner in the Materials and Interfaces Department, to prepare her own paints and grounds (materials for preparing canvases – some she has developed especially for different fabrics).

Painted on preprinted industrial fabric, Amitay-Sadovsky's big picture seems to encompass a viewpoint that is wider than our field of vision. The dense, tangled landscape outside windows and doors draws the attention inside to domestic scenes. On second glance, however, these elements appear to slip into an alternate reality. Amitay-Sadovsky writes: "The uterus is a city. The city is a sea. In the sea there's a tree. The tree is a helicopter. The helicopter is a fish. The window is a painting. The floor is a puddle and the ceiling a sixties dress."

Among other places, Amitay-Sadovsky's work has been exhibited in the Gordon Gallery in Tel Aviv and at the University of California at Berkeley, where she conducted postdoctoral research.



Sparks of Science

Kasu's Story

Like many young immigrants, Kasu Takale lives in two worlds – the one at home with her family and that of the Israeli culture in which she spends much of her time. In the decade since Kasu arrived with the rest of her large family in Israel from Ethiopia, she has overcome many obstacles – language being the least of them. Lately, she excelled in the Sparks of Science Program in Memory of Moshe Pergament offered by the Davidson Institute of Science Education, the educational arm of the Weizmann Institute.

Kasu was chosen to participate in Sparks of Science because of her high grades in the girls' school she attended at Kfar Habad, as well as her scores on the entrance exam. She is grateful for the chance she was given: "The most important thing, more than anything else, is the way they kept at me, not letting me give up even when things got hard." Now, she understands that the sweat and effort she has invested can pay off in a glowing future.

"My mother raised us in a village in very basic conditions," she says. "We received some preparation before coming to Israel, but it was not enough to help us get by." Today, the young Ethiopian girl who barely understood what was said to her has blossomed into a young Israeli woman who is poised to serve in the army in a technological field of her own choosing, and from there, to continue on to university.

At home, Kasu is the pride of her mother and an inspiration to her younger siblings. Another sister is already looking into enrolling in Sparks of Science. Kasu's mother is thrilled. "Our parents never stop encouraging us to study – to refuse to settle for an easier choice. Even if they don't understand exactly what I do, it is important to me that they see me apply myself to my studies, and I know they will always stand behind me."

All that is right

A major gift for the Sparks of Science program came from Hana and Irving Pergament of New York last year, and a wing of the Davidson Institute was named in memory of their son Moshe Pergament, who died in 1997 as a young adult. At the dedication of the wing, Moshe's sister Tali said, "I commend both educators and students alike for devoting their time and energy to building the future. This program stands for all that is right, just as Moshe did. He continuously inspired young people to reach higher and strive toward a bigger goal. He believed in the children he taught, and gave them the confidence to believe in themselves. This program is now part of our family."

Kasu Takale (r) and her mother

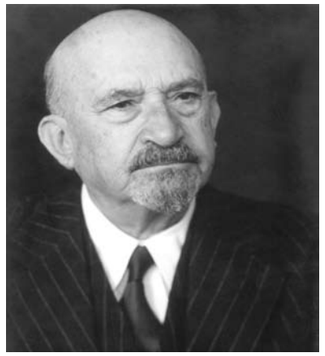
Sparks of Science in Memory of Moshe Pergament year-end ceremony

A decade of Sparks

This year's Sparks of Science Program in Memory of Moshe Pergament year-end ceremony marked ten years of the program. Offered by the Davidson Institute of Science Education, the program aims to promote science and technology skills among students whose families immigrated to Israel from Ethiopia, and to increase their chances of being accepted into academic studies in these fields. To help celebrate, those who have passed through the program in previous years were invited to attend; a number of those present are already working toward graduate degrees in science and technology fields.

- 157 students have successfully completed the four-year program.
- As of December, 2011, there were 126 students taking part in grades 9 through 12, up from 50 in the first year.
- All of the Sparks of Science graduates have completed their Israeli matriculation exams (Bagrut) and all have joined the IDF forces or other civil service.
- Twenty graduates are studying various fields of science and technology in the IDF's Academic Reserve (Atuda). Twenty-three graduates are studying in academia: medicine, law, economics, engineering, communications, optometry, dentistry and social work.

Film: Statesmen and Architects



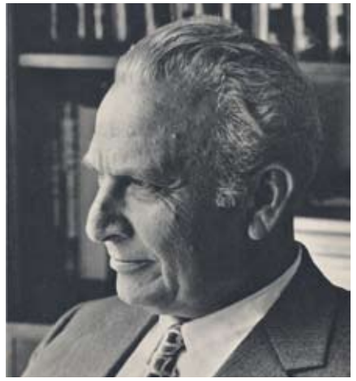
Dr. Chaim Weizmann

A number of documentary films on figures connected with the Weizmann Institute have had special showings on campus in the recent past:

Chaim Weizmann: In *The Statesman*, filmmakers Dan and Noit Geva present fascinating insights into the public figure and private personality of Israel's first president. *The Statesman* – the first full-length film on Dr. Chaim Weizmann – uses his own words, taken from some of the thousands of letters he wrote, including 1,500 to his wife, Vera. These letters are in the Weizmann Archives on the campus of the Weizmann Institute.

Erich Mendelsohn

Erich Mendelsohn: The film *Incessant Visions*, directed by Duki Dror, shows the life of the architect who is most closely associated with the Weizmann Institute – Erich Mendelsohn. The film follows Mendelsohn, his wife Louise and daughter Esther from their somewhat bohemian life on the outskirts of Berlin, where Albert Einstein was a personal friend, to Israel and finally to the US. The first building Mendelsohn designed in Israel – Weizmann House – and the last – the Daniel Wolf Building – are both on the Weizmann campus, and the filmmakers plan to screen the film around the world in the places Mendelsohn worked.



Prof. Ephraim Katzir

Ephraim Katzir: Another documentary recently screened at the Weizmann Institute was produced especially for a memorial ceremony for Prof. Ephraim Katzir, fourth President of the State of Israel and world-renowned Institute biophysicist. The film highlights the private, human side of this scientist and statesman, combining interviews with Katzir in which he recalls the early days of the Institute, his relationship with Chaim Weizmann and his decision to accept the presidency, with the personal reminiscences of his son, daughter-in-law and fellow scientists.

The Art in Fungus, *Naama Lang Yona*

The Beauty of Science

A small bit of laser beam that escapes its confines creates a swallow-like impression of light; a gel that would normally show dark bands appears as delicate, neuron-like branches reminiscent of Japanese ink-painting.

The idea of exhibiting scientific imagery for its aesthetic value started with a display assembled by for a Biological Chemistry departmental conference. A second exhibit, in the Feinberg Graduate School lobby, contains around 70 scientific images – all submitted by Institute students. Like good art, many of these images invite one to look a little deeper at the world, from a new perspective – to contemplate the beauty in the world made visible by science.

The Biological Chemistry Department's exhibit was organized by Dr. Tamar Paz-Elizur. The *Beauty of Science* exhibit was organized by Dr. Naama Geva Zatorsky, with assistance from members of the Feinberg Graduate School and the student council.

Sports and Science

Windsurfing and Soccer

Long before research student Shiri Ron discovered brain research, she was a competitive windsurfer. Growing up in Eilat, her high school years revolved around the sport, and she won a number of competitions, including the world women's youth championship in Thailand, in 2001.

Army service and university studies at Ben-Gurion University of the Negev took Ron away from Eilat and the ocean, but they didn't take away her need to participate in physical sport. She joined the university soccer team, but soon moved up to the local women's major league team – Maccabee Beersheba.

Now, she continues to travel two evenings a week to Beersheba for practice and games. Her lab partners are supportive and even occasionally come to watch her play. Sports, says Ron, gives her life balance, letting her "switch off" the scientist in her and release some excess energy between long hours of intensive work in the lab. Ron recently switched from the neurobiology labs of Profs. Yadin Dudai and Menahem Segal to the group of Dr. Ofer Yizhar, where she works with a new technique called optogenetics – controlling neuron activity with light in order to study brain activity.

Shiri Ron, then and (opposite) now

Ultra Marathon

Ziv Zwighaft, a student in the lab of Dr. Gad Asher of the Biological Regulation Department, came in first in a 127 km, international ultra-marathon in the Galilee. Zwighaft, who researches the mechanisms of circadian rhythm when he's not running, finished in 15 hours – one hour ahead of second place. While most ran this marathon in groups, as a relay, about 100 completed the whole thing. Zwighaft says that scientific research is a lot like distance running: "You have to pace yourself, knowing when to push and when to slow down a bit; you have to be prepared for the obstacles in your path; to remember you're in it for the duration. But the goal at the end is worth it."

Ziv Zwighaft

Thank You

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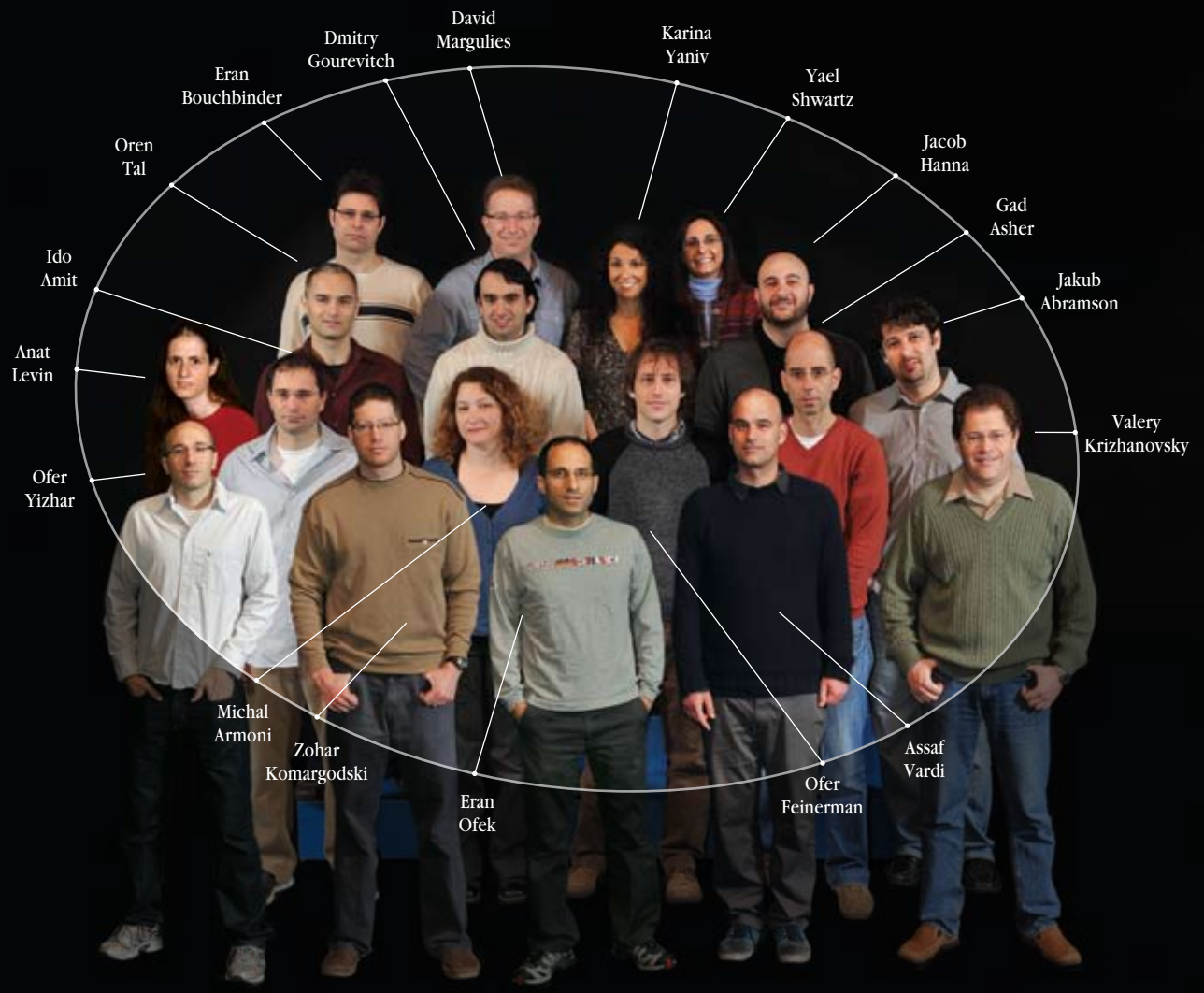
10 THINGS we didn't know about **Prof. Michael Sela**

Institute Professor Michael Sela, the incumbent of the W. Garfield Weston Professorial Chair of Immunology, served as the sixth President of the Weizmann Institute of Science. He is the only scientist in Israel, and probably in the world, to have invented and hold patents on two blockbuster drugs. One is Copaxone®, for the treatment of multiple sclerosis; the other is Erbitux® for treating cancer. He is the recipient of many awards; most recently he was promoted to Commander in the National Order of the Legion of Honor by decree of the President of the French Republic. In addition to promoting scientific research on many fronts, Prof. Sela and his wife, Sara, are ardent supporters of culture and the arts in Israel.

1. His first profession was weaving. He learned to weave as a 14-year-old Polish refugee on Romanian soil.
2. He did not study biology in school but, rather, chemistry and physics. He became interested in the life sciences during his research and turned his efforts in that direction (an uncommon choice for that time).
3. English is his seventh language after Polish, German, Russian, Romanian, French, and Hebrew. After mastering English, he learned Italian and Czech.
4. As a student at the Hebrew University, he won first place in a university ballroom dancing competition. Today, he serves as president of the Friends of Batsheva Dance Company.
5. He explained to Pope John Paul II why patents are necessary for drug development. (Without patents, large companies will not find it profitable to invest in development and clinical trials.)
6. He received the Israel Prize when he was only 35 years old, together with the author Izhar Smilansky, painter Joseph Zaritsky and actor Yehoshua Bartonov.
7. In his opinion, the opposite of the truth is not necessarily a falsehood. It might simply be a different truth.
8. He is an admirer of Meir Weisgal (third president of the Weizmann Institute) for his ability to converse on the same level with kings and peasants.
9. Sela was born in 1924 in Poland, grew up in Romania and immigrated to the land of Israel in 1941.
10. After receiving his master's degree in chemistry from the Hebrew University in 1946, he worked in Italy in the effort to smuggle Jews into Israel and as an attaché for Israel-Czechoslovakia trade routes.



Young Scientists

These young scientists joined the Weizmann Institute in 2009-2010, as part of the continuing effort to renew the scientific base of the Institute, broaden its research scope and help return talented young academics to Israel. Some are already producing new results in such theoretical fields as astrophysics; others are setting up some of the most advanced labs in their fields to answer outstanding questions on stem cells, circadian clocks and more. Expect to see them soon in these pages.