SCOPUS

THE MAGAZINE OF THE HEBREW UNIVERSITY OF JERUSALEM

Volume 55, 2008

Feeding the World

The Wonder of Stem Cells

Obliged to Act

Routes to Roots

האוניברסיטה העברית בירושלים
The Hebrew University of Jerusalem

THE HEBREW UNIVERSITY OF JERUSALEM

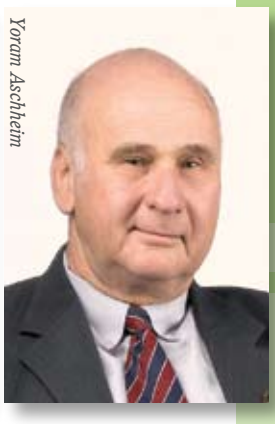
The Hebrew University of Jerusalem, Israel's first university and a symbol of the cultural rebirth of the Jewish nation in its ancestral homeland, is a multidisciplinary institution of higher learning and research. It is a scientific center of international repute, with formal and informal ties extending to and from the worldwide scientific and academic community. It is an institution where thousands of young Israelis receive a university education with an emphasis on excellence; where advanced, postgraduate study and research are stressed; and where special programs attract many overseas students to pursue degrees or earn credits for transfer. This is a university with a three-fold function: to serve the State of Israel by training its scientific, educational and professional leadership; to serve the Jewish people by preserving and expanding the Jewish cultural, spiritual and intellectual heritage; and to serve humanity by extending the frontiers of knowledge.

LOCATION On four campuses: three in Jerusalem (Mount Scopus, Edmond J. Safra at Givat Ram, and Ein Kerem) and one in Rehovot

ENROLLMENT 22,600 full-time students, including 11,700 undergraduates, 6,600 masters students, 2,500 doctoral candidates and 1,800 overseas and pre-academic students

FACULTY 1,000

RESEARCH 3,400 projects in progress in University departments and in 100 subject-related and interdisciplinary research centers

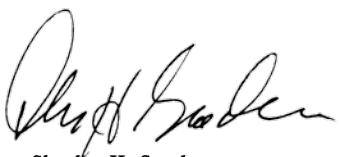


Yoram Aschheim

AT the Hebrew University of Jerusalem, researchers in all disciplines seek to understand, discover, and innovate for the benefit of humanity. Indeed, this is the impetus behind a new vision — as featured in the cover story — that is being implemented at the Faculty of Agricultural, Food and Environmental Quality Sciences. The vision builds on the Faculty's well-established reputation for agricultural innovation, aiming to address the challenges involved in providing sufficient healthy food for the world's growing population while protecting and sustaining the environment.

This determination to effect change is a recurrent theme in other areas of teaching and research. In these pages, you'll read how three social work undergraduates created a national campaign to improve benefits for Israel's impoverished Holocaust survivors, and two graduates of the University's Saltiel Center for Pre-Academic Studies overcome personal challenges to pursue their academic studies. Likewise, researchers in the life and biomedical sciences are at the cutting edge of adult and embryonic stem cell research, while a senior scientist who recently returned to Israel from the United States has established an exciting new center that optimizes biotechnology to provide affordable and accessible healthcare.

The ongoing cuts in government budgets to higher education, along with the lengthy strike called by senior faculty at the beginning of this academic year, present the Hebrew University — and the State of Israel — with unprecedented challenges in its pursuit of academic excellence. As always, we thank our loyal and extensive network of friends, whose ongoing support shows a profound understanding of these challenges. It is this understanding and support that will ensure that our world-class research and teaching will continue for the benefit of Israel, the Jewish people and humanity.



Charles H. Goodman
Chairman, Board of Governors

Menachem Magidor
President

Cover: Dr. Naomi Ori of the Faculty of Agricultural, Food and Environmental Quality Sciences studies leaf development in tomato plants at the newly opened International Center for Protected Agriculture in Semi-Arid Areas, established with the support of Robert H. Smith. See page 7.

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A New Vision

According to Professor Eli Feinerman, Dean of the Faculty of Agricultural, Food and Environmental Quality Sciences — which will shortly be named in honor of Robert H. Smith — a new, integrative vision is more than just an administrative preference: it's a vital strategy in the struggle for survival.

"While every country in the world has the potential to grow enough food to feed itself, 54 out of the world's 194 nations currently do not meet their citizens' needs, nor do they have the money to import the staples necessary to fill the gap," he says, adding that while supermarket shelves in the West are overflowing with unprecedented plenty, almost 800 million people are malnourished in the developing world. This situation, he says, is a "wake-up call" to the scientific community.

At the Hebrew University, this "wake-

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At the Faculty of Agricultural, Food and Environmental Quality Sciences, a new vision harnesses the talents and resources of some 100 scientists to address the challenges of providing enough healthy food for the world's growing population while protecting and sustaining the environment

By Sandy Cash

Prof. Eli Feinermann, Dean of the Faculty of Agricultural, Food and Environmental Quality Sciences

the World

Prof. Orna Halevy: Food for All

FAR from the lawns of the Edmond J. Safra Campus at Givat Ram, the historic Mount Scopus campus and the bustle of the Ein Kerem medical campus — all in Jerusalem — the Hebrew University's Faculty of Agricultural, Food and Environmental Quality Sciences in Rehovot is a pastoral treasure.

Founded in 1942, the *faculta* — as it is known in Hebrew — is Israel's only university-level institution devoted to basic and applied research in agriculture and environmental management. Long counted among the world's top such faculties based on its cutting-edge scientific breakthroughs and successful agricultural outreach, one might expect the Faculty to rest on its laurels — or its long shelf-life tomatoes, advanced irrigation systems, bio-control and soil solarization methods, optimized dairy and fish production, and heat-tolerant chicken breeding. However, inside its busy laboratories, a deep sense of responsibility for meeting challenges confronting mankind has led to a new vision.

"Our future is not guaranteed," says agricultural economist Eli Feinerman, Faculty Dean and the Yekutiel X. Federmann professor of Hotel Management. "With a growing world population and decreasing agricultural resources, it's becoming increasingly difficult to provide enough food for everyone's needs. We believe that synergetic, integrative and interdisciplinary research across traditional boundaries will lead to the scientific advances needed for fighting hunger."

Professor Orna Halevy, founding head of the Faculty's combined MSc/PhD program in animal sciences and veterinary medicine, agrees that cross-disciplinary research is essential to agricultural success. A member of the team who helped formulate the Faculty's reorganization plan (see sidebar opposite), she welcomes the bridge that will link the buildings housing the Department of Animal Sciences and Koret School of Veterinary Medicine to form the Complex of Animal Sciences and Veterinary Medicine. Constructing a psychological bridge between the two is equally important, she says.

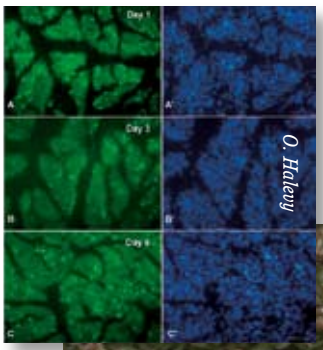
"Animal scientists study normal, healthy animals, while veterinarians care for sick animals. Individually, we've amassed a great deal of knowledge about the same organism. It makes sense that we should work closely together, but it's surprising how unusual this is," says Halevy, adding that the proposed Complex will be the first of its kind in the world. "By pooling our expertise, it will be easier to move forward on crucial questions of animal health and food production."

Food production — specifically, the production of poultry meat — has been the focus of Halevy's work for the last 17 years. The incumbent of the Charles Charcowsky Chair in Poultry Science and Animal Hygiene, Halevy is an authority on the intricate process by which muscle tissue is developed in chicks, with her research underlying practical stratagems for economical meat production in the poultry industry.

"My work focuses on 'satellite' cells — precursor cells that proliferate at the very end of embryonic development and in the first few days after chicks hatch," she says. These cells, which are also involved in regeneration of damaged muscle, are an important indicator of meat potential.

Halevy's research has demonstrated that one of the best ways to grow a heavy chicken is to use a specific light source. "Back in the 1970s, it was shown that irradiation with green light increases their weight. My departmental colleague, Prof. Israel Rozenboim, and I conducted a series of experiments in which we illuminated chicks with various monochromatic lights to see if there was any effect on muscle growth. We found that illuminating post-hatch chicks with green light caused the highest proliferation of satellite cells and, subsequently, the most robust muscle growth." This technique is currently employed by poultry farms in Israel and the United States.

Halevy went on to discover that illuminating incubated eggs produced even better results. "For farmers, it is



Prof. Orna Halevy has studied satellite cell proliferation (inset) in poultry when illuminated by monochromatic light

Illuminating chicks and incubated eggs with monochromatic lights increases meat potential

easier to illuminate eggs than a coop full of live chicks," says Halevy.

While intermittent light is used in the case of eggs in order to avoid overheating them, in joint research with Professor Shlomo Yahav of the Ministry of Agriculture's Volcani Center, Halevy found that application of higher temperature heat actually increases meat production. "Chickens that have been genetically selected for meat production have high mortality rates when the weather gets hot," explains Halevy. "Prof. Yahav showed that short-term, post-hatch exposure to elevated temperatures improves chicks' ability to regulate their body temperature and survive. But there was also an unexpected side effect: these heat-resistant chickens produced more meat. We were able to demonstrate how heat exposure is linked to increased satellite cell proliferation."

Halevy and Yahav's "heat shock" technique is now being tested for the poultry industry in cooperation with the University of North Carolina. But, Halevy says, its greatest application may be in the world's poorest countries, where high temperatures are a fact of life. "This could be a way to rethink an environmental disadvantage — and turn it into a tool for more efficient food production."

Dr. Naomi Ori: Leaf Life

While Prof. Halevy looks at how animal cells can be coaxed from the embryonic stage to their full potential, Dr. Naomi Ori of the Faculty's Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture is studying how plant organs such as fruit, branches and leaves come into existence. "Animal embryos comprise most of the organs that eventually develop in the adult. Plants, however, develop entirely new organs — leaves, branches, flowers and fruits — dynamically, as they grow," she says. "This flexibility is made possible by formative organs known as meristems, which maintain a reservoir of precursor cells. Since plants do not have mobility, the creation of new organs is one way they adapt to environmental change."

>> continued from page 4

up call" was enthusiastically taken up by Honorary Chairman of the University's Board of Governors Robert H. Smith who has extended his full support to a multi-year reorganization plan that is already affecting the physical fabric of the Faculty, while at the same time speeding the pace of academic collaboration.

At its core is an integrative vision which creates four major units around which all future research at the Faculty will be based: the Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture and the Institute of Biochemistry, Food Sciences and Nutrition, plus two new institutes — the Institute of Environmental Sciences and Natural Resources in Agriculture and the Complex of Animal Sciences and Veterinary Medicine. In addition, to further facilitate and fuel integrative and interdisciplinary approaches to agricultural sciences — and encourage innovation and creativity — the Faculty will establish four interdisciplinary research centers that will focus on: basic agricultural sciences; sustainable animal health and husbandry; environmental protection, sustainability and bio-energy; and nutrition and functional food.

This ambitious plan will create solid foundations for collaborative research across the entire agricultural continuum. "Our mission will be to fund research projects that combine the work of scientific teams associated with two, three or even four of our core institutes," says Feinerman, adding that the structural changes are partly based on the highly successful model of the Smith Institute, which brought together three formerly distinct departments and has since become a center of excellence, with a dramatic increase in research productivity and an impressive array of additional

Ori's research focuses on meristems and the development and design of what she calls "the most important organ in the world: the leaf." As new leaves are formed, older leaves age and are eventually shed. But using genetic techniques, Ori has successfully forced the expression of "meristematic" genes in adult leaves, so that leaves that are due to wither and die remain green for longer. This finding could impact agricultural applications aimed at increasing the shelf-life of crop plants.

In another project, Ori — working with Smith Institute colleague Prof. Daniel Zamir and Dr. Yuval Eshed of the Weizmann Institute of Science — has identified a gene involved in "sealing" the process by which leaves emerge from the embryonic stage and take on a new, fully differentiated identity. Working with tomato plants, she found that the mutation of a single gene short-circuits the normal leaf-formation process. "Our work focuses on Lanceolate, a gene whose mutated form reduces the tomato plant's complex leaf pattern to a single spear-shaped leaf," she says. "It turns out that mutant Lanceolate puts an early end to the process by which meristematic cells differentiate, signaling to the plant that the leaf has reached its final form, even though it really hasn't."

Confirmation of Lanceolate's role in signaling the completion of leaf development came in the form of another study, in which Ori manipulated tomato plants so that the "terminate" signal came too late. "As opposed to our previous experiments, this time the meristem-based production of new sub-leaf structures didn't know when to stop. This resulted in huge leaves that retained, for months, the characteristics of young leaves that have just emerged from the embryonic stage."

Alongside these genetic studies, Ori is also conducting joint research with Dr. Eran Sharon of the University's Racah Institute of Physics on how geometrical and mechanical constraints affect leaf shape. To date, the two researchers have developed a new technique for mapping leaf topography, and are quantifying the forces that trigger the growth of simple, symmetrical leaves, as opposed to leaves with wavy, "rumpled" edges.

While her work may lead to practical applications in achievements. "By breaking down the boundaries, we will promote knowledge-sharing and the development of a strong, knowledge-driven agriculture.

"Under this new, integrated paradigm, we will be far better equipped to examine the scientific, technological, business and social repercussions of agricultural options, and ultimately, to translate research into innovative solutions," says Feinerman. "This will enable the Faculty to realize its full potential in research and teaching, and make a significant contribution to human well-being."

Sasson Tiram

Arnon Brand

Dr. Naomi Ori (above) studies plant meristems and the leaf varieties they generate (below), as well as the changes that occur in plants such as tobacco (top left) as leaves die and new leaves are formed

Sasson Tiram

In his studies of soil-based pollution Dr. Benny Chefetz (above) and his team collect samples from Israel's Kishon river (above right).

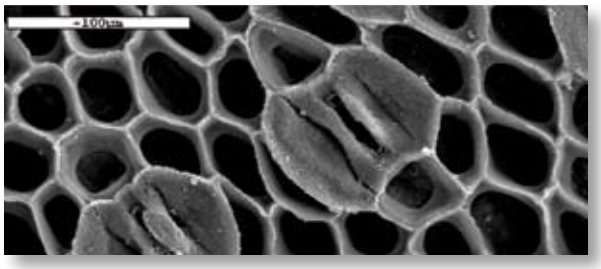
agriculture such as increasing the shelf-life of crop plants, Ori stresses the importance of the basic plant science that underlies such developments. "The questions are fascinating: How do leaves decide to grow? How do they know when to stop? At the same time, if you know how to control leaf differentiation, you can affect the plant architecture. Since we are essentially controlling leaf growth on the genetic level, this work could have implications for crop design."

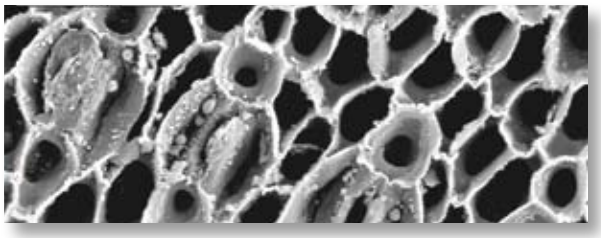
Dr. Benny Chefetz: Waste Not

Of course, to grow crop plants, you need land — and water. The Faculty of Agricultural, Food and Environmental Quality Sciences has a worldwide reputation for forward-thinking solutions for Israel's limited agricultural resources. At the same time, says Dr. Benny Chefetz of the Department of Soil and Water Sciences, techniques used to solve problems sometimes cause others.

"Israel is a world leader in the utilization of treated wastewater in agriculture," says Chefetz. "I study the fate of organic pollutants that treated water leaves in the soil, including pesticides, herbicides, even antibiotics."

The first in Israel to identify residual pharmaceutical materials in treated wastewater used for crop irrigation, Chefetz is now studying how this residue gets into groundwater beneath agricultural fields. "Treated wastewater is important for improving the agricultural output of arid countries — like Israel — that have a limited fresh water supply," Chefetz says. "Our studies may indicate that water treatment should be improved. We may need to restrict the use of wastewater to specific crop plants, or areas where groundwater cannot be





The plant cuticle (top) is used to clean up polluted water by absorbing heavy metal ions (below) that can then be transformed into metal nanoparticles

contaminated. Clearly, we must increase knowledge and awareness of this type of pollution in order to take appropriate action to prevent it."

Dr. Chefetz is also examining the uptake of organic pollutants by the plant cuticle, the waxy layer that covers all plant surfaces. While some scientists study the cuticle to elucidate how pesticides enter the foods we eat, Chefetz is digging deeper and examining the fate of these materials in the soil after plant decomposition.

In another study, which focuses on soil-based pollution, he is examining Israel's Kishon river, which flows from Mount Gilboa through the Jezreel Valley and empties into the sea at Haifa Bay — but not before sweeping up large quantities of industrial contaminants from bayside oil refineries, chemical plants and sewage treatment facilities. "I am looking at oil-based pollution hidden in the river's underlying sediment," he says. "It turns out that the Kishon riverbed suffers from two types of contamination. Sediment in the upper river is characterized by the particulates of air pollution, the result of incomplete burning of fossil fuels. But the closer you get to Haifa, the sediment pollution changes, and there are more actual fuel residues.

"But even if we find a way to clean up the river, contaminants in the sediment will still be released upward into the water. It is imperative to realize that these different threats require different treatment strategies."

Devising effective clean-up methods for the Kishon depends on effective cooperation between scientists from different disciplines. In a unique project linking plant sciences, environmental clean-up and profitable high tech, Chefetz has

A Visionary Gift

The naming of the Faculty of Agricultural, Food and Environmental Quality Science in honor of Robert H. Smith, to be officially marked in June 2008, reinforces the Smith family's longstanding bond with the Hebrew University — Robert H. Smith is an honorary chairman and former chairman of the University's Board of Governors, and the holder of an honorary doctor of philosophy degree from the University. Indeed, the gift gives impetus to other University friends to join in supporting the comprehensive new vision for the Faculty.

During their most recent visit to the Rehovot campus, in November 2007, Robert Smith and his family attended the inauguration of the International Center for Protected Agriculture in Semi-Arid Areas, a state-of-the-art complex whose creation they assisted. "The Center is a crucial facility," says Alexander Vainstein, Wolfson Family professor of Floriculture and head of the Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture, "because it supports the development of transgenic plants which are an invaluable tool in plant biotechnology." The Center will ultimately comprise two large controlled greenhouses, two semi-controlled greenhouses, a screen house and field laboratories.

"The Center's greenhouses," says Vainstein "are among the most sophisticated in agricultural research and unique in Israel, allowing the propagation of transgenic plants even during our hot summers. Not surprisingly, space in the greenhouses is at a premium among our researchers."

Douglas Guthrie

Smith family members (from third left) Robert, Michelle, David and Clarice tour the newly established International Center for Protected Agriculture in Semi-Arid Areas with (far left) Prof. Alexander Vainstein and master's student Efrat Kaisler

Sasson Tiram

Dr. Oren Froy

shown how the plant cuticle can help clean up polluted water — while creating an industrial component by-product that is valued by the electronics and photographic industries. Working together with Faculty colleague Professor Elisha Tel-Or and Professor Aharon Gedanken of Bar-Ilan University, Chefetz has devised a method in which plant cuticle materials absorb heavy metal ions which can then be transformed into metal nanoparticles using simple, microwave-based techniques. "It's a cheap and effective strategy," says Chefetz, "for turning environmental waste into 'gold'."

Dr. Oren Froy: Time to Eat

Profits aside, the ultimate goal of agricultural resource management and food production is good nutrition, equitably distributed throughout our hungry planet. According to Dr. Oren Froy, of the Faculty's Institute of Biochemistry, Food Science and Nutrition, a full, healthy life is connected both to what we eat — and when.

Froy is an expert on circadian rhythms, the 24-hour cycle of physiological activity in living organisms governed by the biological clock. This "clock" comprises an area of the brain located just above where the optic nerves cross, a fact of cranial geography that explains how patterns of light and darkness produce varying levels of oscillating biochemical signals. These signals, in turn, mediate processes ranging from bird migration to the human sleep-wake cycle.

Using a mouse model, Froy has shown in his research that the biological clock can be "reset" by restricted feeding or calorie restriction regimens, transforming nocturnal animals into animals that rise with the sun, when food is made available. Indeed, he was the first to suggest a more provocative hypothesis that this "reset" can wind back the biological clock, leading to an extended life span.

"There have been many scientific studies of how calorie restriction leads to an extended lifespan in a mouse model, but no one has figured out exactly why this occurs," says Froy, whose work also encompasses biochemical studies of the uptake of specific nutrients. "Our experiments show that when food is available for only a few hours a day, the

Global Benefit

For Ethiopian-born Bayissa Hatew, agricultural training at the Hebrew University's Faculty of Agricultural, Food and Environmental Quality Sciences is a family affair. Having completed the one-year master's program in food and nutritional sciences at the Faculty, he opted to stay on to write a master's thesis under the joint supervision of Dr. Natan Gollop of the Ministry of Agriculture's Volcani Center in Bet-Dagan and Dr. Oren Tirosh of the Faculty's Institute of Biochemistry, Food Science and Nutrition. Hatew was recently joined by his wife Tenagne who is enrolled in the 2007/2008 master's degree course in food and nutritional sciences at the Faculty.

Hatew's initial encounter with the Hebrew University of Jerusalem was as a participant in one of the short courses run by the Faculty in cooperation with the MASHAV Center for International Cooperation at Israel's Ministry of Foreign Affairs. The 25-day training course that he took in animal sciences helped round out his previous work in which he used satellite images to track optimal grazing areas and seasons in Ethiopia's cattle-rich Borana region.

According to Hatew, his participation in the course, together with his master's studies, have gone a long way in helping his development as a research scientist. "When I began the master's program — for which I received a scholarship from the Pears Foundation — I was a little nervous, because my academic background is not in nutrition," he says in softly accented, flawless English. "But I came to realize that science is science regardless of the particular field, and I started to make good progress.

"In doing the research for my master's thesis on anti-microbial agents produced by poultry-borne bacteria, I am gaining the basic and advanced modern research skills and knowledge at an international

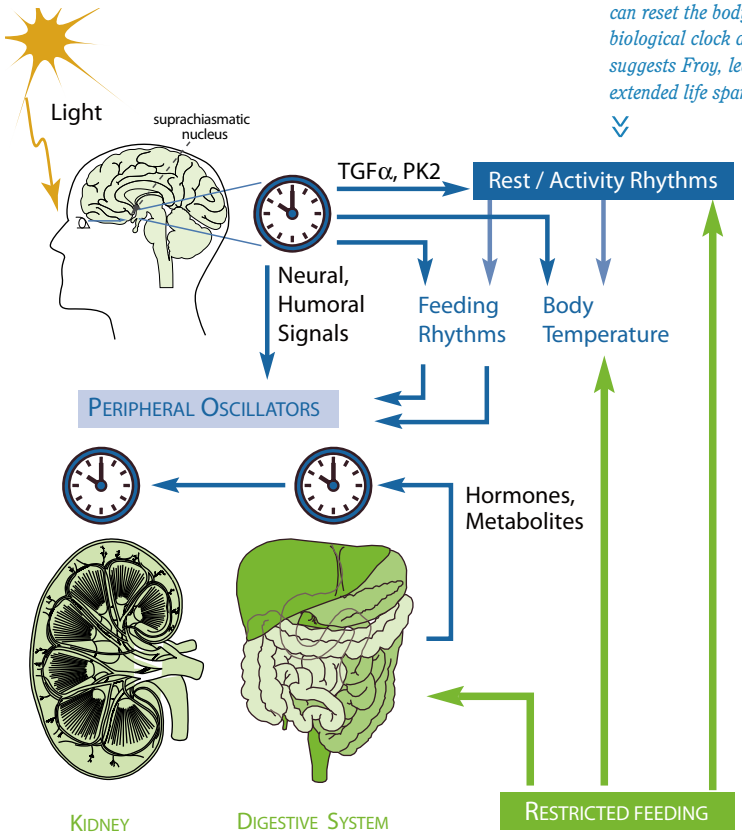
reset circadian system exhibits high-amplitude oscillations — like loud "ticks" of our biological clock. This stimulates a heightened expression of genetic factors known as clock genes. These genes synchronize many of the body's basic functions, and when more of them are produced, our body systems are more 'in-sync' and make fewer mistakes — this can minimize wear and tear, and possibly lead to longer life."

Froy is not the first person to link clock genes with human health, but he is the first to find a causal link between circadian rhythms and longevity. "Low amplitude of clock gene expression is associated with a range of medical conditions, from depression to cancer," Froy explains. "Lowered levels are also linked to oxidative stress which triggers the damaging 'free radicals' associated with ageing. This is why we believe that boosting clock gene expression may lead to a longer life span."

Froy is currently preparing to test his hypothesis in another animal model, the *Drosophila* fruit fly. "The average fruit fly lives only about two months, which makes it an excellent model for clarifying exactly how the biological clock and feeding regimens affect life span," he says.

In another area of his research, Froy is looking at how a balanced circadian rhythm contributes to the body's innate immunity, a phenomenon familiar to anyone who has ever fallen ill soon after a bout of jet lag. Together with his work on feeding regimens and life span, this work could eventually be parleyed into techniques for raising healthier livestock, or for raising the quality of human life. ■

Restricted feeding or calorie restriction regimens can reset the body's biological clock and, suggests Froy, lead to an extended life span



Bayissa and Tenagne Hatew at the Rehovot campus

Susson Tram

level that will make me a more effective researcher as well as a better teacher in my home country."

The Faculty's international programs for foreign students have existed for almost two decades, attracting over 1,600 overseas students from some 120 countries. Run by the Faculty's Division for External Studies, the programs comprise short, postgraduate courses and the master's program, with the latter training participants in the latest knowledge-based techniques in two key areas in preventing starvation: food and nutritional sciences, and plant sciences. According to Hatew, such training can have a significant impact on the students' home communities, as well on the way the students view themselves.

"I grew up in a rural area, and the walk to high school was so long that I would sleep there during the school week," recalls the 31-year-old. "My family still doesn't understand exactly what I'm doing so far away from home — they just know I'm studying." Hatew knows, however, that when he returns to Ethiopia he will be equipped with the modern tools that will help solve his country's need for skilled manpower and he will also share the knowledge he will have gained in Israel.

By Heidi J. Gleit

Three social work students advocate for social change for Israel's impoverished Holocaust survivors

Obliged to Act

THERE are thousands of Holocaust survivors living in poverty in Israel. This is a fact but, until three undergraduates at the Hebrew University's Baerwald School of Social Work and Social Welfare took action, it was practically a secret. In spring 2006, Asaf Rajuan, Michal Gomel and Eylona Fiszman, then in the second year of their BSW studies and specializing in community work, were shocked to learn that one-third of the approximately 240,000 Holocaust survivors in Israel were impoverished. They launched a campaign and, within 18 months, the plight of Holocaust survivors was on the national agenda and had led to a change in government policy.

Even though the Holocaust had no direct affect on his family, Asaf Rajuan felt its significance as an Israeli teenager. "It spurred my interest in human rights, our place in the world, and other dilemmas that youth struggle with," says Rajuan, currently completing his law studies at the Hebrew University for a second undergraduate degree.

"Israel is good at glorifying its warriors, but it also must glorify those who had enough faith in humanity to start new families after the horror of the Holocaust. No one recognized that the elderly in our neighborhoods were the survivors, no one thought of them as individuals and asked what they needed," he says.

During Passover 2006, Rajuan heard a brief radio report that one in three survivors lives below the poverty line. "I had to do something; my conscience wouldn't let me ignore it," he says. He soon found that several of his classmates felt similarly.

Eylona Fiszman's great-grandmother and grandparents are all survivors. "My family lives in France and receives compensation directly from Germany, so I was shocked to learn what happens here," she says. "We felt obliged to act," adds Michal Gomel.

The three asked their friends and fellow students to wear black shirts instead of the traditional white — in protest at the abandonment of survivors — at the upcoming ceremonies for Holocaust Heroes and Martyrs Remembrance Day. "We provided people with the tools and information to make a decision and take a small, meaningful step," says Rajuan. "Most people at ceremonies held at the Hebrew University, Ben-Gurion University of the Negev and Sapir College wore black shirts. It was the first time that I heard speakers relate directly to the plight of survivors at this type of ceremony."

Although their overall aim was to improve the situation of all of Israel's elderly, "we decided to start small by focusing on survivors before tackling the even bigger issue," says Fiszman. Thus they launched the 'Every Survivor Has a Name' campaign demanding government recognition of the rights of all survivors to receive assistance, a significant increase to the budget of the Holocaust

Ariel Jerozolimski

On Holocaust Heroes and Martyrs Remembrance Day 2007, students and young people marched from the Knesset to Yad Vashem in a protest rally

Survivors' Welfare Fund and approval of legislation to recognize the rights of all survivors to support and benefits.

To create a base for the campaign, they mobilized the student council at the Baerwald School, recruited Tafnit movement founder Maj.-Gen. (res.) Uzi Dayan and MK Colette Avital to the cause and worked with documentary makers Guy Meroz and Orly Vilnai Federbush whose TV exposé 'The Morals of Restitution' shocked the country. Over the next 18 months, they also organized a series of demonstrations that received massive public support and much media attention, leading the government to create a commission on Holocaust survivors. In August 2007, the government announced new benefits and welfare services for Holocaust survivors, who also would be honored during the country's sixtieth anniversary celebrations in 2008. In October 2007, benefits were also announced for the "second circle" of survivors, mainly those who fled the Nazis and became refugees, later immigrating to Israel from Russia in the 1990s.

"THE issue of social justice is prominent at the Baerwald School," says Gomel. "Using the tools that the School gave us to both address the subject and implement what we had learned, we were able to bring about social change. We consulted with our lecturers, the School helped us with the student council, and we worked with the Student Union, Hillel House and many others."

"The Hebrew University gave us a mission as well as an education," says Rajuan. "We learned about human rights and felt capable of putting what we learned into practice."

"We have really excellent and committed students," says Professor Gail Auslander, Baerwald School Dean and incumbent of the Zena Harman Chair in Social Work. "Many are idealistic and we try to nurture and transform their commitment into professional success through a combination of academic studies and fieldwork performed under professional guidance. We teach them how to work with a group, identify issues, recognize potential leaders to work with, and work with others to bring about change in specific areas in order to promote the wellbeing of the family or community."

Now that Gomel, Rajuan and Fiszman have graduated, third-year social work student Dani Zarzevsky heads the student council and is continuing the campaign. "It is not only about giving money to survivors," he says. "They need services and assistance with mental health and other problems that money won't solve," he says. The council is also advancing other causes, such as the plight of refugees from Darfur seeking shelter in Israel.

'the issue of social justice is prominent at the Baerwald School'

"I learned a great deal from our work — how to run a public campaign, work with a coalition of organizations and the media, and more," says Michal Gomel, now earning an MSW in the Middle East Program in Civil Society and Peace Building at McGill University in Canada which accepts 12 Israeli, Jordanian, and Palestinian students each year. "I learned a lot about the subject itself, most significantly that Israel is the only Western country in which Holocaust survivors reside that has not anchored their status in law. I also learned that the battle to help elderly survivors must be expanded to helping all the elderly in Israel. It is not only one-third of survivors who live in poverty, but one-third of all elderly people and I believe that must change."

For Rajuan, the campaign's success is also a personal victory over those who said he wouldn't be able to change the system. "The biggest achievement isn't the funding," he says, "but the survivors who thanked me for the respect that they finally received and the sense that, after 60 years of feeling rejected by society, Israel cares about them." ■

Sasson Tiran

From left: Eylona Fiszman, Asaf Rajuan and Michal Gomel

New Directions


Yoram Aschheim


Douglas Guthrie

IN a comprehensive vision that spans a wide range of disciplines, the Hebrew University of Jerusalem has been actively exploring — and setting into motion — innovative approaches to teaching and research. At the Faculty of Medicine, a reorganization plan to optimize interdisciplinary collaboration and harness the tremendous talent of faculty and students is being realized by the new Institute for Medical Research (IMR). According to Professor Howard Cedar, a winner of the prestigious Wolf Prize for 2008, "The IMR is not just about buildings. The existing facilities were built in 1966, when the concept of research was very different and distinct disciplines worked separately. That was fitting for a small lab setting then. Tackling any scientific problem today necessitates a multidisciplinary approach. While each lab needs different approaches, collaboration among faculties and disciplines is essential. We cannot make strides without a combination of expertise."

The Faculty of Humanities is undergoing a revolution of its own, which stems from the efforts of an international committee of experts charged with envisioning a viable future for the humanities. Though home to internationally renowned academics and several rising stars, the Faculty is highly cognizant of the need to revitalize a field that, worldwide, must compete with a growing preference for more "practical" fields. New projects being planned include an international graduate school, a prestigious fellowship program and a new constellation for undergraduate and graduate teaching programs.

While the Hebrew University's endeavors in neuroscience have been characterized for several years by intensive interdisciplinary and cross-Faculty cooperation as well as internationally recognized research, this discipline is poised to take a giant leap forward by means of an influx of new talent and additional state-of-the-art research facilities. Building on its advances such as deep brain stimulation as a treatment for Parkinson's disease and increased understanding of artificial limb movement, it is expected that the Hebrew University will be rated one of the top centers for neuroscience worldwide.

As reported elsewhere in *Scopus* (pages 4-6), researchers at the Faculty of Agricultural, Food and Environmental Quality Sciences are currently adopting a new, integrative structure in order to enhance the development of new ways to produce sufficient healthy food for the world's growing population without harming the environment.

None of these initiatives would be possible without the support of the University's friends worldwide, says University Vice-President for External Affairs Carmi Gillon. "We welcome our friends to join us in strengthening these important initiatives. There can be no more important legacy for Jerusalem, or for Israel. Support of these projects not only contributes towards a positive impact on Israeli society, but also on the world." Support is also crucial for the absorption of new, young faculty members, adds Gillon. "The brain drain is a major threat to Israel's future — we have lost too many of our best and brightest in recent years. By providing jobs and first-rate research infrastructures, we can provide a viable alternative in Israel to universities abroad for Israel's most talented young minds." ■





Hold the Date

Friends of the Hebrew University scheduled events during 2008 include:

March 6-9	**Prague** European Friends 2008 conference 'Asia Encounters the Occident: Dialogue of the Future'
March 10-11	**Geneva** Swiss Friends' weekend seminar, with keynote speaker Efraim Halevy
March 12	**Los Angeles** American Friends' Harvey L. Silbert Torch of Learning Award Law Society Dinner honoring William M. Shernoff
March 19	**Paris** French Friends' 'Words of Women' debate during French book week
April 6	**Florida** American Friends' 'Paws for a Cause' Dinner in support of the Koret School of Veterinary Medicine
April 13	**Vancouver** Canadian Friends' Excellence in Medical Research benefit honoring Dr. Larry Goldenberg
May 7	**Chicago** American Friends' Scholarship Luncheon honoring David Rubin
May 13	**London** British Friends' Patrons' Dinner
May 14	**London** British Friends' public lecture by Sir Martin Gilbert
May 14	**Winnipeg** Canadian Friends' Gala Dinner honoring Dr. Frank Plummer
May 15	**Apeldoorn** Dutch Friends' Scopus Award Gala honoring Karel van Oordt, founder of Christians for Israel
May 20	**Old Jaffa** Israel Friends' benefit in support of the University's Veterinary Teaching Hospital
May 22	**Toronto** Scopus Gala Dinner honoring Isadore Sharp
June 1-4	**Jerusalem** Board of Governors Annual Meeting
June 12	**Seattle** American Friends' Torch of Learning Award Luncheon honoring The Coe Law Group, PLLC; Bader Martin, P.S.; and Michael L. Novick
July 3-6	**Crans Montana** Swiss Friends' Symposium on Love, plus golf tournament
July	**Buenos Aires** Argentinean Friends' Innovation Seminar
September 18	**Chicago** American Friends' Scopus Award Dinner honoring James Matanky
September 19-21	**Deauville** European Friends' second Jewish Peoplehood Forum, plus golf tournament
September 25	**New York** American Friends' Truman Peace Prize Dinner with award recipient Ambassador Dennis B. Ross and Richard Plepler, Chairman
October	**Paris** French Friends' Scopus Award Gala Dinner
November	**Jerusalem** Canadian Friends' Live and Learn Tour
November 9-10	**Jerusalem** Board of Governors' Executive Committee Meeting
November	**St. Petersburg** Russian Friends' Tolerance Prize 2008 ceremony
December	**Chicago** American Friends' Scopus Dinner honoring Jerold Solovy
December	**Florida** American Friends' Mar-a-Lago Scholarship Luncheon


Canada

The Toronto Chapter of the Canadian Friends launched a $4 million fundraising campaign at a gala reception attended by over 150 people in tribute to Isadore (Issy) Sharp, the Chairman and CEO of Four Seasons Hotels and Resorts, in recognition of his endowment of the Isadore Sharp Einstein Doctoral Scholarships at the University. Canadian Friends' Executive Leadership Team (from left): Honorary Dinner co-chair Lionel Schipper, Friends' National President and Dinner co-chair Ronald Appleby, gala honoree Isadore Sharp, Board of Governors Honorary Chairman and Honorary Dinner co-chair Ralph Halbert, Toronto Chapter President and Dinner co-chair Nathan Lindenberg.

Israel

Chairman of the University's Yissum technology transfer company Dr. Giora Yaron (right) showed Faculty of Science Dean Prof. Hermona Soreq and her husband Tuvi a book about his Caesarea home, where he and his wife Zila hosted some 200 Israeli business leaders at an Israel Friends' tribute to the contributions of the University and the hi-tech industry to the country. Proceeds went towards faculty recruitment.

Switzerland

The highlight of the Swiss Friends' lecture 'Spoliations and Restitutions of Works of Art' by lawyer and art specialist Marc-André Renold was a special viewing of Gustav Klimt's 'The Apple Tree' which was lent for one day to event co-sponsor, Geneva art gallery Artvera. From left: Marc-André Renold, Swiss Friends' President Nilly Sikorsky and Friends' Honorary President Dr. Eric Hauf.

Mexico

Faculty members Prof. Dorit Aharonov (computer science), Prof. Shulamit Katzav-Shapira (medicine) and Prof. Ilana Pardes (comparative literature) were the guest speakers at the Mexican Friends' ever-popular 'Three Women, Three Expressions' annual symposium.

Fotostein

Punta del Este

University Vice-President for External Relations Carmi Gillon and journalist, writer and Scopus Award laureate Dr. Pilar Rahola were the keynote speakers at the Argentinean and Uruguayan Friends' annual Punta del Este summer symposium. From left: Argentinean Friends Executive Director Jana Roitemberg, Argentinean Friends President Roberto Nul, Carmi Gillon, Dr. Rahola, journalist José Henrique Cymerman and Uruguayan Friends President Susana Zolkwer.

A World of

France

Leading politician Simone Veil was presented with the French Friends' annual Scopus Award at a gala dinner in Paris. From left: Scopus laureate Lily Safra, University President Prof. Menachem Magidor, Simone Veil, actress Elsa Zylberstein, Scopus laureate Baron Eric de Rothschild, French Friends President Florence de Botton and Scopus laureate Bernard-Henri Lévy.

United States

The American Friends' and the University's Lautenberg Center for General and Tumor Immunology annual Maimonides Award Dinner paid tribute to Marc and Cathy Lasry and Meera and Marc Mayer. From left: Friends' Executive Director Peter Willner, University Board of Governors' Honorary Chairman Harvey Krueger, honorees Marc and Cathy Lasry and Meera and Marc Mayer, American Friends' Chairman Ira Lee Sorkin and President of the Friends' Greater New York region Martin Karlinsky.

Norma Lee and Morton Funger (center) were presented with the American Friends' Scopus Award by University President Prof. Menachem Magidor (left) and Board of Governors Honorary Chairman Robert H. Smith at the American Friends' Scopus Award Gala Dinner in Washington, D.C.

Israel's Ambassador to the United States Sallai Meridor (right), seen here with American Friends' President George A. Schieren and University Board of Governors Deputy Chair and Campaign Co-Chair Barbara Mandel, was one of the speakers at the American Friends' sixth Annual Leadership Education Forum (ALEF).

Germany

President of the Central Committee of German Jews Charlotte Knobloch was presented with the Scopus Award by the German Friends of the Hebrew University at a gala dinner held in the magnificent Kaisersaal in the Munich Residenz. From left: University Rector Prof. Haim D. Rabinowitch, Charlotte Knobloch, University President Prof. Menachem Magidor and German Friends President Ron C. Jakubowicz.

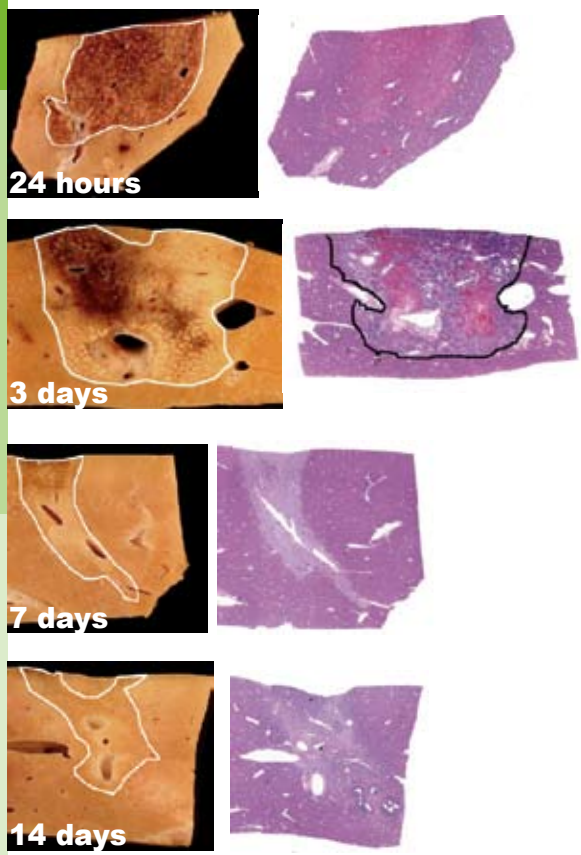
United Kingdom

Outgoing Chair of the British Friends Michael Gee (right) was awarded the Sternberg Interfaith Award by Sir Sigmund Sternberg (left) and University President Prof. Menachem Magidor at the British Friends' Benefit the World Dinner at the Victoria and Albert Musuem which marked the Hebrew University's contributions to communities worldwide.

Serving Humanity

By Gail Lichtman

A leading scientist returns to Israel and establishes a center that harnesses biotechnology to develop affordable healthcare and help the underserved



Treating liver cancer with irreversible electroporation kills the tumor and allows the tissue surrounding it to heal within two weeks

BORIS Rubinsky has wasted no time in ensuring that the Research Center for Biomedical Engineering in the Service of Humanity and Society, which he established at the end of 2006, is living up to its name. The inventor of a revolutionary tumor therapy who returned to Israel after a distinguished 27-year career at the University of California at Berkeley, Professor Rubinsky is firmly focused on finding solutions to healthcare problems.

"Bioengineering tries to solve practical problems in biology and medicine using a broad-based approach that integrates knowledge from almost every field of science," says Rubinsky, whose new Research Center and its corollary graduate program in biomedical engineering are based at the University's Selim and Rachel Benin School of Engineering and Computer Science. "In bringing together the Hebrew University's outstanding strengths in the areas relevant to bioengineering — life sciences, physics, medicine and computer science and engineering — our new Center creates enormous possibilities for interdisciplinary research collaboration."

The Center's underlying philosophy is "to apply biotechnology to help the underserved," says Rubinsky. "But developing new, less expensive technology to enable affordable healthcare doesn't mean less advanced technology," he stresses. "In fact, it has to be more advanced in order to be both effective and affordable."

Rubinsky immigrated to Israel from Romania at age 13, served in the army for five years and received his bachelor's and master's degrees from the Technion – Israel Institute of Technology before going to Massachusetts Institute of Technology for his doctorate. He was appointed to the faculty of the University of California at Berkeley in 1980 immediately after graduating, but continued to maintain close ties with Israel throughout his years in the US. When his son moved to Israel, he decided that the time was ripe to return. "I had offers from almost every Israeli university, but I decided on the Hebrew University because of its reputation for excellence."

Indeed, the Hebrew University-Rubinsky union has already captured the attention of aspiring — and astute — young scientists. The graduate program, reports Rubinsky, is thriving with six doctoral and three master's students already enrolled. "Without even advertising, applications have been coming in from all over Israel. The program brings all the University's areas of expertise into one focused application, making it a highly attractive option for serious students of biomedical engineering."

RUBINSKY'S major breakthrough of the past years is a non-invasive tumor therapy called irreversible

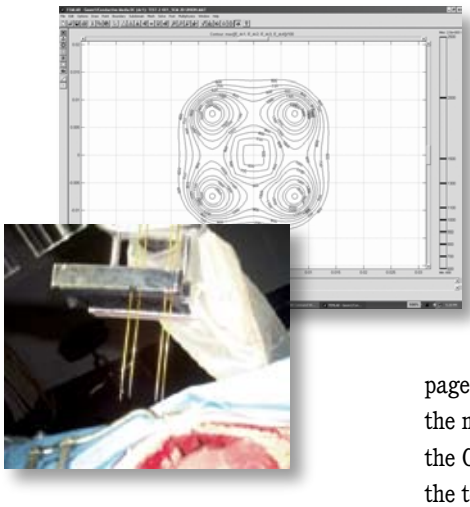
electroporation (IRE) that kills tumors within microseconds by using electrical pulses — and without damaging surrounding tissue. It is considered one of the most important advances in the treatment of tumors to have been developed in recent years. "I found that when you apply microsecond-long electrical pulses across a cell, the cell membrane develops nanoscale defects and dies," says Rubinsky, who has registered some 21 patents for inventions over the years.

"As a minimally invasive, targeted surgical technique, IRE is regarded as a highly promising treatment for cancers in the brain, liver and, possibly, the pancreas — in all these cases, avoiding damage to surrounding tissue is essential. All that is required is to insert probe-like needles into the tumor, apply a brief electrical field and the tumor dies. The technique is so simple that it could be performed by nurses who generally give flu shots, thus enabling its use in clinics in remote areas and in the developing world."

With IRE currently at a highly advanced stage of development — having been tested on cells and small animals and having received US Food and Drug Administration approval for clinical trials — work at the Research Center for Biomedical Engineering in the Service of Humanity and Society continues apace under Prof. Rubinsky's supervision.

Electrical impedance tomography, a technique using sub-sensory electrical currents (too mild to be felt), measures voltage by means of a sophisticated computer and produces inexpensive medical images. "We have successfully applied this technique to develop a portable device for detecting breast cancer, with images transmitted to a cell phone," says Rubinsky, who has received a $2 million grant from the National Institutes of Health for the project. "It could replace home self-examination in the industrialized world or be used in places like India where more people have cell phones than electricity." The technique harnesses distributed medical imaging technology, whereby costly hardware located in one central facility can serve large numbers of users who receive and transmit information and images via low-cost cell phones.

Working with colleagues in Mexico, where the death of one in four women during childbirth is due to undetected internal bleeding, the Research Center is developing a non-invasive, electromagnetic detection system. The technique can also be used to detect internal bleeding in the brain and other tissues. Doctors at the Hadassah-Hebrew University Medical Center have expressed great interest in using it in the emergency room, says Rubinsky.



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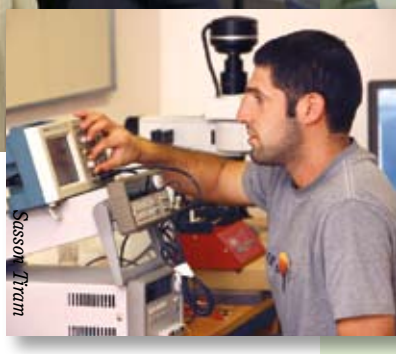

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In another project, being carried out in conjunction with the Sheba Medical Center at Tel Hashomer, cryopreservation promises to prolong the period an organ can be held in extremely cold conditions before transplantation, without incurring any damage.

The Center's researchers are likewise working on a technique for separating stem cells from adult human bone marrow for the potential treatment of heart failure and spinal fracture. With funding from Johnson & Johnson, the project is being conducted in collaboration with Professor Dan Gazit, head of the Skeletal Biotechnology Laboratory at the University's Faculty of Dental Medicine (see page 26). Gazit's group is developing the molecular biological aspects, while the Center is focusing on developing the technology.

"In this and all our other projects, we are not only developing affordable and easy-to-use detection and imaging, but also easy-to-implement treatments," says Rubinsky. "In doing so, we seek to live up to our philosophy that the best medicine is also that which is most available." ■

Prof. Rubinsky and doctoral students Mohamad Shini (left), Avigayil Ben-Or (right) and Roee Ziv (inset)

Portable at-home mammography kit harnesses electrical impedance tomography to produce medical images relayed by cell phone

Irreversible electroporation, as applied in surgical procedure and as schematic drawing

Three scientists at the Racah Institute of Physics study cosmological phenomena

Beyond Imagination

By Susan Goodman

TO delve into astrophysics is to take a journey beyond our wildest imaginings.

On a clear, dark night glance upward and you can see not only bright individual stars but also a faint hazy band of light. You are looking at our galaxy, the Milky Way. Here several hundred billion stars are slowly rotating about a black hole at its center. Our Sun, a modest star, is located near the outer edge of this immense spiraling disc.

The Milky Way is bound by the force of gravity to a similar galaxy (Andromeda) and about 40 other dwarf galaxies in our part of the universe. They form what is known as the Local Group which measures about 10 million light years across (one light year is the distance traveled by light in one year and is roughly equal to 10,000 billion kilometers, or 6,000 billion miles).

When these groups have larger numbers of galaxies in them they are called "clusters."

This is where the first part of our story begins — about 300 million light years away in a group of about 1000 galaxies, called the Coma cluster.

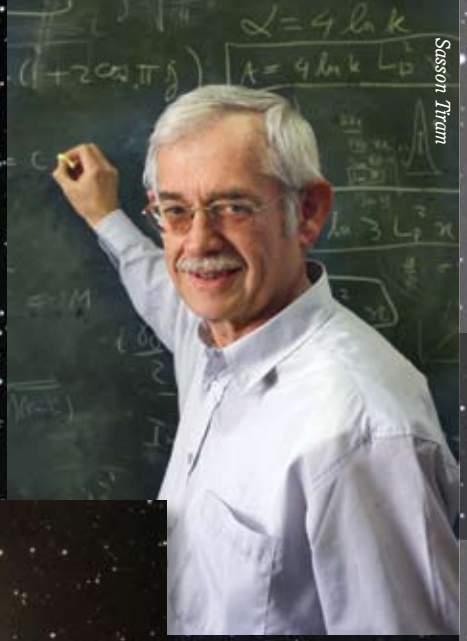
Dark Matter is Conjured

In 1933 Fritz Zwicky, working at the California Institute of Technology (Caltech), measured the speed of galaxies moving in the Coma cluster and discovered something totally unexpected. The galaxies were moving so fast that, according to Newton's law of gravitation, they should have been flung out into space. The calculations showed clearly that there wasn't enough visible matter around, not enough gravity. By the 1970s "dark matter" had been invoked to explain this and other cosmological phenomena that have been observed since then.

The problem with dark matter is that you can't see it. But as soon as you assume it's there, it can explain why spinning galaxies and clusters don't fall apart. Nowadays, about a quarter of the energy content of our universe is assumed to be this mysterious substance. It outweighs ordinary visible matter by about six to one and so exerts a stronger gravitational force.

Bekenstein was determined to further develop Modified Newtonian Dynamics

Jacob Bekenstein, the Michael Polak professor of Theoretical Physics, a member of the Israel Academy of Sciences and Humanities and an Israel Prize laureate in physics, was never happy about dark matter. "You could always have as much of it as you needed to explain things," he says, "but I didn't really pay much attention to it; I was working on other things." Indeed, Professor Bekenstein's work on the thermodynamics of black holes established his reputation as a world leader in gravitation physics.



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Photos of galaxies courtesy of Robert Gendler/www.robgendlerastrophtcs.com

Move Over Newton

In 1982, Bekenstein met with fellow astrophysicist Professor Mordehai Milgrom of the Weizmann Institute of Science. Milgrom had recently found that if you modified Newton's law of universal gravity then you could explain the rotation of a spiral galaxy as well as the motions seen in certain clusters. None of this required the existence of dark matter.

When Milgrom "presented me with the facts — and there weren't many known at that time — I was converted almost on the spot to MOND, the scheme of Modified Newtonian Dynamics," recalls Bekenstein, who resolved to turn the description of what is observed into a new theory of gravity.

At that time, illness confined Bekenstein to bed for a month, thereby enabling him to work uninterrupted on the new theory. In 1984 the Milgrom-Bekenstein theory was published. However, this new version of MOND couldn't explain the way light is bent when it passes massive objects like galaxies. The existence of this so-called "gravitational lensing" had been predicted by Einstein's theory of general relativity. However, when eventually measured by astronomers it was found to be much stronger than they expected from the amount of matter in a particular galaxy: it was yet another reason for introducing dark matter.

Bekenstein was determined to further develop MOND in order to explain the results of this gravitational lensing and yet be consistent with the principles of relativity. Twenty years later illness again laid him up and the work on the new theory was completed. In 2004 Bekenstein's TeVeS theory was published. Unexpectedly, it was found not only able to explain gravitational lensing but also a whole range of other cosmological phenomena which had previously required invoking dark matter.

Dark Matter Matters

Of course, one must recognize that the much more widely accepted cosmological theory postulates the existence of dark matter. Important theoretical work in this field has been done by Avishai Dekel, the Andre Aisenstadt professor of Theoretical Physics and Head of the University's Authority for the Community and Youth, who has played an important role in measuring the cosmological dark-matter content and the universe's even more mysterious dominant component — "dark energy". Part of his recent work has dealt with observations which seemed to question the idea that dark matter is found around all galaxies.

In 2003, information collected about the motion of stars in the outer regions of elliptical galaxies indicated that they were moving too slowly for there to be much dark matter around. Since elliptical galaxies are thought to be formed by mergers of spiral galaxies, it seemed strange that the dark matter should suddenly have disappeared.

Professor Dekel, an expert in galaxy formation, used

Prof. Jacob Bekenstein, inset: elliptical galaxy in Virgo, background: section of the Andromeda galaxy, the closest large spiral galaxy to the Milky Way

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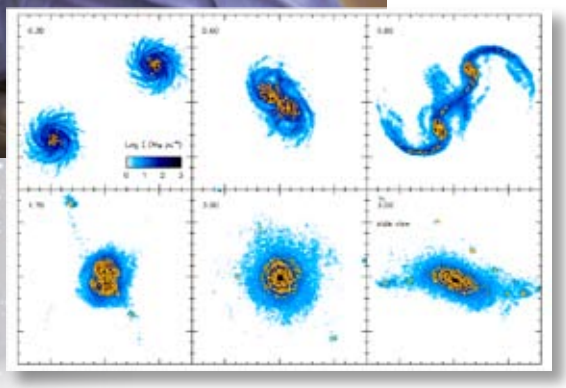


Prof. Avishai Dekel and (inset) diagram showing merging galaxies

dynamical considerations and supercomputer simulations of merging galaxies to arrive at a simple explanation for why these stars show low velocities despite the presence of a massive dark matter halo. "This is not evidence against the existence of dark matter," he says. "To the contrary, it is a natural prediction of standard dark-matter theory." Dekel hopes that "the actual elementary particle that constitutes dark matter will be detected in an experiment, possibly in the near future, in the world's largest particle accelerator at CERN in Switzerland."

Concludes Prof. Dekel: "The existence of dark particles is as plausible as that of luminous particles. I therefore see no need for any speculative modification of the standard physics of Newton and of Einstein's theory of general relativity."

Meanwhile, Prof. Bekenstein notes that the dark matter versus TeVeS debate may be resolved in just a few years with the 2008 launch of the European Space Agency's Planck satellite and the completion of its mission by about 2010.

Cosmological Explosions

While you are looking at the night sky it is worth contemplating that everyday, somewhere in the observable universe, there is an explosion so enormous that it will emit for a few seconds as much radiation as all the stars in the whole observable universe put together.

Such explosions can never be seen, however, since they radiate gamma rays which our eyes can't detect. In fact, these mysterious "gamma-ray bursts" were only discovered during the Cold War era, when the Americans sent a military satellite into space to check that the Russians were abiding by the treaty banning the explosion of nuclear devices in space. While amazed to detect bursts of gamma-

Newton in Jerusalem

Isaac Newton was arguably the greatest physicist of all times, with his achievements including the synthesis of celestial and terrestrial mechanics in his laws of motion, the law of universal gravitation and his theory of light and colors. An outstanding mathematician too, he created the calculus (also invented independently by Leibniz) which became the basic tool of theoretical physics. Newton's lesser known aspect — as a deeply religious scholar with a profound interest in the Bible, the New Testament and ancient history — is the focus of the 'Newton's Secrets' virtual exhibition, part of the David and Fela Shapell Digitization Project at the National Library of Israel, which was known as the Jewish National and University Library until recently. The virtual exhibit is based on a recent exhibition at the Library

From the Yahuda Collection at the National Library of Israel

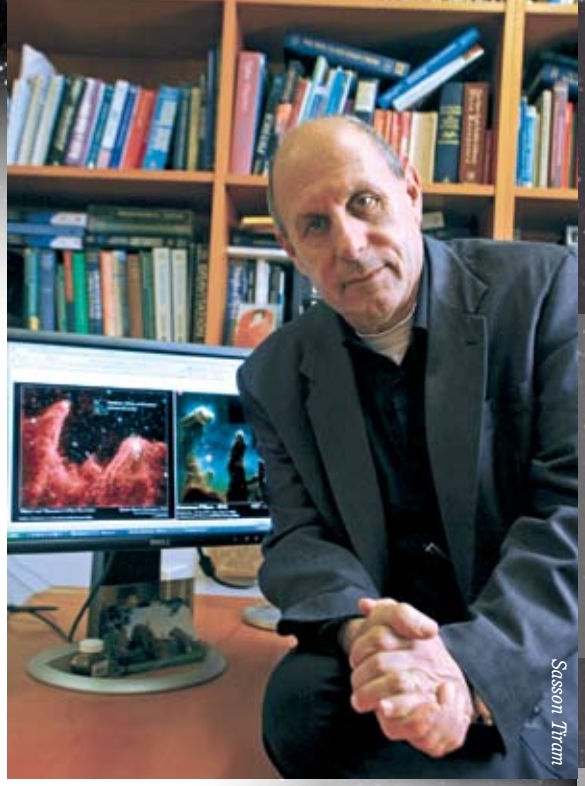
A trilingual manuscript by Newton, written in Latin, Hebrew and Greek, comprises notes on the Jewish Temple, Temple ritual and related matters

ray energy, it was clear that they were too far away to be bombs. In fact the discussion soon centered on exactly how far away they were. The consensus among astrophysicists was that these explosions were taking place somewhere in our galaxy.

Professor Tsvi Piran, the incumbent of the Schwartzmann University Chair, was skeptical. "It didn't fit," he explains. "I suggested that they were much further out — on the other side of the universe! And if that was true, then the energy released had to be enormous." Other predictions about the nature of these explosions were made by Piran and his team, including his student Re'em Sari, who recently returned to the Hebrew University as a faculty member after nine years at Caltech. The team's work was confirmed in 1997 by the observations of the Italian-Dutch BeppoSAX satellite.

At about this time Professor Piran also established a model, now generally accepted, which suggests that many of these explosions are caused by the collision between neutron stars, which are cold "dead" stars which have run out of energy. Piran describes these extraordinary heavenly events with evident fascination and excitement: "These explosions are so gigantic that they stand alone as beacons at the edge of the observable universe. But it is fortunate that they are so rare: in a million years you could expect one in our galaxy." Indeed, an explosion of this enormity would be devastating for our planet.

Clearly, there are still many puzzles to unravel in our understanding of gamma-ray bursts. The North American Space Agency (NASA) has spent hundreds of millions of dollars studying this phenomenon and, during 2008, data from the GLAST (Gamma Ray Large Area Telescope) satellite is expected to provide a clearer picture of the extraordinary events that lead to these unique cosmological explosions. ■



Sasson Tiram

Prof. Tsvi Piran

which displayed manuscripts and illustrations by Newton never previously shown in public. Curators of the exhibition, which attracted much local and international attention, were Professor Yemima Ben-Menahem of the Hebrew University's Department of Philosophy, Professor Mordechai Feingold of Caltech and Professor Stephen Snobelen of the University of King's College in Halifax, Canada.

The manuscripts reveal that Newton's interests encompassed alchemy, theology, ancient history and even calculations to determine the date of the end of the world (his estimate was 2060). He also sought to decipher what he regarded as "secret knowledge" encoded in the Bible and other ancient cultures' sacred texts. "He applied the same meticulous diligence to his studies of these texts as to his scientific research — he related to science with a religious fervor that led him to see himself as some sort of prophet," says Ben-Menahem, incumbent of the Barbara Druss Dibner Chair in The History of Science. Exhibit highlights include: Newton's studies of Solomon's Temple, a passage copied from Maimonides' writings, comments on Hebrew expressions, excerpts from the *Shema* prayer and his rejection of the Trinity.

"Our Newton collection, a bequest of Abraham Shalom Yahuda, is one of our many treasures," says National Library academic director Professor Carl Posy, also of the University's Department of Philosophy. "Our virtual exhibitions fulfill the role of a traditional research library, offering invaluable aid to scholars. They also humanize mythical figures like Newton, Maimonides, Buber and others in a way that informs the public and even inspires young minds. Indeed, the recent Knesset law giving the former Jewish National and University Library 'national library' status signals a comprehensive upgrade that includes strengthening our digital components to expand our research role, and also to become an educational and cultural force in Israel and a pro-active face of Israel to the world."

'Newton's Secrets' virtual exhibition: www.jnul.huji.ac.il/dl/mss/newton/

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Asher Sofan in the Law Library, Faculty of Law

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By Susan Goodman

Two graduates of the University's Saltiel Center for Pre-Academic Studies, now studying for their degrees, share a passion to make their mark

Dreams Come True

Asher Sofan

Spend even a short while with second-year law student Asher Sofan and you know that you are in the presence of a very determined, highly intelligent, and angry young man who expresses himself clearly and sharply. "The Mechina healed me," he says, "and my experience there gave me what the government should give society — a clear message that with hard work you can achieve your ambitions."

Sofan's childhood years in Ashkelon could easily have crushed his spirit and limited his horizons. "When I was six, three of my four siblings and I were placed in an orphanage because my parents were found to be incapable of raising children," he says. "We grew up in a very poor neighborhood where crime and drugs flourished." Though he talks of the orphanage very positively, higher education was never given a thought. "The message was to do your three years of military service, then get a job and, above all, stay out of trouble — and jail."

Sofan's father died when he was 13 and he left the orphanage at 15 because, as the oldest son, he felt responsible for providing for his family. "The only important thing in my life was to survive," he says. When he was 23, he decided to try to change his life and pursue his dream of studying law. Fortunately he had heard about the Joseph Saltiel Center for Pre-Academic Studies at the Hebrew University — or Mechina, as it is known in Hebrew — and enrolled in July 2005. He describes his first weeks as full of self-doubt. "I was totally unsure that I'd be able to succeed, I had no learning habits whatsoever, and my self-esteem was low," he says. He soon found that the Mechina was staffed by "caring, excellent teachers, and the students were very supportive of each other. We were united by our common experience."

Today, Sofan is studying for his law degree as part of the Atidim social leadership program at the University's Federmann School of Public Policy and Government whereby participants must work in the public sector in their hometowns for at least five years after graduation. Sofan is frank about his ambitions. He quotes the late French sociologist Pierre Bourdieu: "Crime is not only caused by lack of opportunities,

it is also caused by the availability of a lot of illegitimate opportunities." His view is clear: "I hold society responsible for the poor and the weak among us," he says. Sofan wants, eventually, to enter politics where he hopes to generate a society that truly cares about its disadvantaged members and encourages everyone to strive for education so that they can realize their potential.

Zehava Chananya

"What would I do if I could relax for a few hours?" Zehava Chananya repeats the question she has been asked, but is stumped. For 24-year-old Chananya, a third-year chemistry student at the Faculty of Science on the Edmond J. Safra Campus at Givat Ram, life is unremitting: her passion for studying, her determination to succeed, and the need to earn money to support her family — these are the demands and challenges she faces every moment of every day.

A five-hour flight in 1990 brought seven-year-old Chananya and her family to Israel from Ethiopia. Her mother and five siblings now live in an Ethiopian enclave in Rehovot. It is a desperately poor neighborhood, where high unemployment and inadequate education have driven the community into a downward spiral fueled by drugs and crime.

Chananya's mother, although totally uneducated and engaged in the daily struggle to provide for her family's basic needs, instilled in her children the immigrant's eternal mantra: "Education is the key to a better life." Chananya quotes her mother's wisdom with obvious pride and gratitude.

After graduating high school and doing two years of national service, Chananya realized that to fulfill her dream of higher education she needed to improve her school grades. When she heard about the Mechina, Chananya knew that this was her way forward.

The demands of the intensive study program at the Mechina meant she had barely any time to work. She was forced to live, after paying her rent, on about $3 a day, which had to cover food, clothes, books and her bus fare home every weekend. A cleaning job on Fridays supplemented her meager resources. Nevertheless, Chananya's eyes shine as she recalls that year — "the teaching was fantastic and the Mechina prepared me in so many ways for studying at the University."

Today, she is thriving. Fascinated by her chemistry course, she plans to go on to graduate studies in pharmacology.

Sasson Uram

She receives more financial aid than she did while at the Mechina and she has a job that occupies every hour that she is not studying. The money she earns goes to her siblings — "to help them get an education," she says.

Zehava Chananya again considers what she would do with a few free hours. She smiles. "Twelve years ago I went swimming with my school. I had a wonderful time. I would love to go swimming again." ■

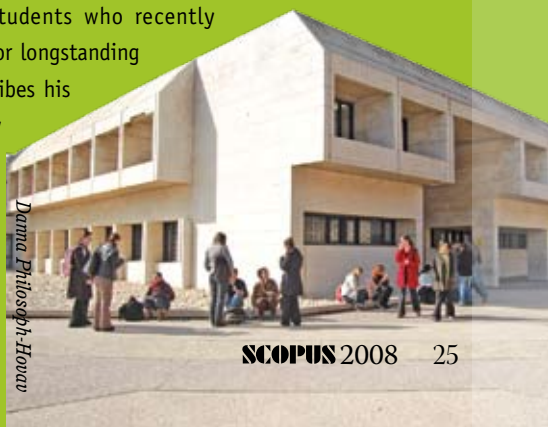
Zehava Chananya in the recently completed Student Laboratory Building, Faculty of Science

A Second Chance

"We offer a second opportunity to improve school grades and gain admission into higher education," sums up the Mechina's dedicated director Liat Mayberg. Over 500 students a year, a microcosm of Israeli society, study at the Mechina, with about half coming from underprivileged backgrounds. Over 90 percent go straight onto higher education, over three-quarters of these at the Hebrew University.

The Mechina has flourished under its outgoing academic head Professor Ruth Sperling, who has led it since 1997. Internationally renowned for her work on RNA processing, Sperling regards the Mechina as an important personal priority. "It has been a privilege to be part of this educational effort of the Hebrew University, changing the lives — both academically and personally — of so many students each year," she says.

Her successor is Professor Uri Bialer, incumbent of the Maurice B. Hexter Chair in International Relations-Middle East Studies and a former Dean of Students who recently received the Michael Milken Prize for longstanding excellence in teaching. Bialer describes his new post as "the crescendo of my life at the University — being part of an institution for youngsters striving to achieve in higher education."



Danna Philosoph-Hovav

Class break at the Mechina, situated in the Buber Rousso Building, Mount Scopus

The Wonder of Stem Cells

By Susan Goodman

University scholars are world leaders in stem cell research, creating the foundations for novel treatments while also elucidating basic processes in the development of life

Adult stems cells are used to regenerate skeletal tissues such as bone (above) and inter-vertebral discs (opposite)

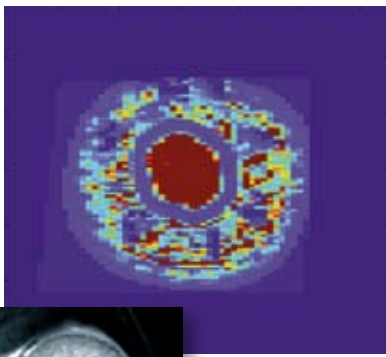
IT was the stuff of science fiction back in the 1970s: the stars of the Six Million Dollar Man and Bionic Woman were so badly injured in accidents that they could only be reconstructed using special hi-tech implants that gave them superhuman powers.

While modern surgical methods utilize plastic and metal synthetic implants, they are not as successful or reliable as the body parts they replace. Of course surgeons have also developed techniques for transplanting whole organs from one person to another — however, spare organs are not readily available. Moreover, when an organ is transplanted into another person it is immediately identified as foreign tissue and is rejected unless the recipient receives powerful medication to deactivate their immune system.

The ideal is for the body itself to be spurred into regenerating tissues and whole organs that have become extensively damaged or non-functioning due to injury or disease: new brain cells to replace those destroyed by Alzheimer's, new muscle for damaged hearts, new nerve tissue for spinal injuries, regenerating bone growth where fractures fail to heal or spinal vertebrae collapse.

The development of stem cell research means that this is now starting to happen, with scientists in the life and biomedical sciences creating the foundations for tomorrow's medical practice. Such research depends on harvesting "uncommitted", or undifferentiated, cells which have not been allocated any specific function. With appropriate biological instructions, these so-called "stem" cells can be triggered to grow into the exact cells or organs needed. The highly versatile, immature stem cells found in the early stages of embryo development are called embryonic stem cells (ESCs). Stem cells, available in minute quantities, in adult bone marrow and fat tissue are called adult stem cells (MSCs).

FOR certain therapies, MSCs offer particular advantages: "When reinjected into the patient they don't produce an immune response," says Dr. Gadi Pelled, a member of Professor Dan Gazit's team at the Skeletal Biotechnology Laboratory in the Faculty of Dental Medicine. "They also have the advantage that you can easily direct them to become a particular type of cell."



Research at the Skeletal Biotechnology Laboratory is well advanced in developing a process whereby MSCs are used to regenerate skeletal tissues like bone, cartilage, tendon and the inter-

Yossi Zamir/Flash 90

vertebral disc in patients with various injuries. Indeed, the lab's work has made it a world leader in the field of tissue engineering. "In particular, there has been much interest in the 'vertebro bioplasty' novel strategy we have developed for curing complex spinal vertebral fractures among osteoporotic women," says Gazit.

Three stages are involved in reaching the goal of tissue regeneration. The first involves fishing out the MSCs from the soup of cells found in bone marrow, where they make up only 0.01 percent of the total. Dr. Zulma Gazit, a member of the team, has developed a unique method for efficiently isolating the MSCs. At the second stage the MSCs, which are capable of growing into a whole range of tissues, must somehow be directed to produce only the cells that are needed. This is done by introducing a specific gene into the MSC.

Gazit's group has become the world's leading lab in developing a completely new method for sneaking new genetic material into the nucleus of MSCs. Called "nucleofection", it involves applying a small electrical current to the MSCs that opens up, for a very short time, microscopic holes — or "nanopores" — in the cell wall through which the special genes can enter. Once inside the cell, these genes give instructions to turn the MSC into a specific committed cell.

Now that the cells are primed for making different skeletal tissues, the third and final stage of the process involves mixing them with a matrix that will carry the cells, by injection, into the site of injury.

Part of this project is already entering a clinical trial with

Dr. Gadi Pelled (left) and Prof. Dan Gazit (center) with team members (from right) Dr. Yoram Zilberman, Dr. Zulma Gazit and Dr. Yossi Gafni

Cell Protection

"Producing fertilized eggs when undergoing IVF treatment requires an immense emotional investment from the couple hoping to have a child," says Professor David Heyd of the Department of Philosophy and a member of the Hinxton Group, an international consortium on stem cell ethics. As a member of an advisory board to the Israeli government on issues of medical ethics, Heyd has given careful deliberation to this area of research.

Ethicists insist that these fertilized eggs remain the property of the parents even when there is no possibility of using them and they have been designated supernumerary or "spares". Israeli law, influenced by halacha (Jewish law), does not allow them to be donated to other infertile couples. The law, however, allows them to donate the fertilized eggs for stem cell research.

Prof. David Heyd

Sasson Tiram

Strict controls, clarifies Prof. Heyd, dictate the nature of the research that can be carried out — and adhere to the internationally recognized principle of according "respect" to the blastocyst with its potential to develop into a human being.

The law is reviewed every five years, not only in response to developments in scientific activity but also because of shifts in public opinion. Attitudes change remarkably quickly. "It took less than a decade for public acceptance of IVF, organ transplant and surrogacy," says Prof. Heyd. "Nothing succeeds like success; as soon as the benefit to people becomes clear, society's attitude shifts — ethical opposition melts away."

Self–renewal of cells as controlled by the Oct.-3/4 gene. Below: Prof. Yehudit Bergman (second from left) and her team
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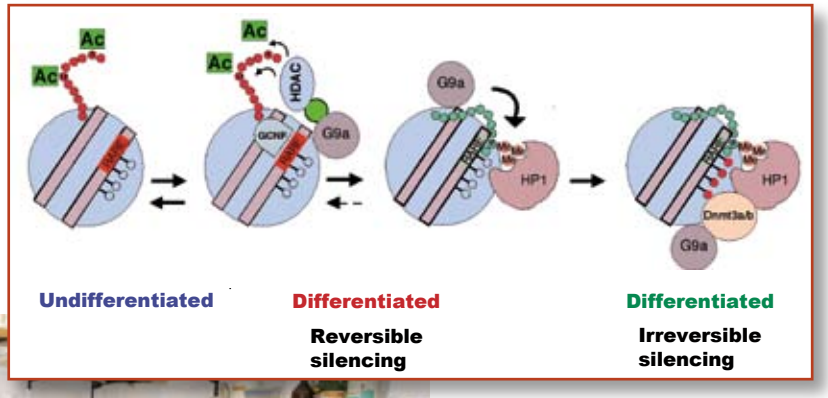



Douglas Guthrie

25 patients. "An efficient method of bone regeneration is close to realization," says Prof. Gazit. "In the future, metal and plastic prostheses will be a part of medical history — stem cells will play a major role in everyday clinical practice."

STEM CELL research not only offers the prospect of tissue regeneration but also holds the key to understanding some of the most basic processes in the development of life. Indeed, the insights gained are crucial in helping scientists identify the various genetic causes for the adult body failing to function correctly, for example when cancer develops or the immune system attacks its own body's tissues.

The details of these fundamental control mechanisms are the focus of a team led by Professor Yehudit Bergman at the Hubert H. Humphrey Center for Experimental Medicine and Cancer Research in the Institute for Medical Research (IMR) and the incumbent of the Morley Goldblatt Chair in Experimental Medicine and Cancer Research. Her team works in close collaboration with IMR colleague Howard Cedar, the Harry and Helen L. Brenner professor of Molecular Biology and Israel Prize laureate in biology who was awarded the prestigious Wolf Prize in 2008 for his groundbreaking research on DNA methylation, a basic process that turns genes on and off.

Using mouse ESCs, Bergman has carried out detailed studies of how the process of self-renewal of cells — which also occurs in humans — is controlled by a gene known as Oct-3/4. To date, she and her team have pinpointed each of the separate stages which repress this gene, thereby leaving the cell free to commit itself to a particular function.

There is considerable interest in the processes associated with this gene because it has been found to be active in cancer of the testes, with the testicular tumors shown to regress when the gene was turned off. There also seem to be other cancers which can be controlled by turning off particular genes. The implication is that the genes which allow stem cells to renew themselves can also allow some cells in the adult body to reproduce unchecked and become cancerous. "Developing methods of controlling these genes could provide the key to controlling certain cancers," says Prof. Bergman.

In a research project supported by the US National Institutes of Health, Bergman's team is also using mouse ESCs to investigate how the immune system is formed in the early stages of embryonic development. Previously thought to be a random and inefficient process, it has been shown instead that it is geared to produce an optimal system.

WHILE the Hebrew University is home to pioneering work using adult stem cells and mouse embryonic stem cells, it is also one of the most prominent centers in the world for research using human ESCs. Hebrew University activity in this area began some 10 years ago, with the second and fourth papers ever published on human ESC research authored by Nissim Benvenisty, the Herbert Cohn professor of Cancer Research and head of the Department of Genetics in the Silberman Institute of Life Sciences. The 23 cell lines

used by Prof. Benvenisty were established by his own lab plus labs in the US and Australia. "Our research is permitted in Israel, the US and Europe," he says.

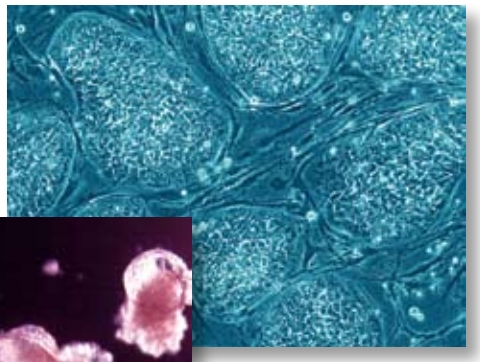
Much of Benvenisty's research has focused on understanding the processes involved in the development of ESCs but he is also concerned with the next stage — enabling ESCs to become part of routine patient treatment. A major obstacle to using ESCs in regenerating healthy tissue is the fact that they do not come from the body they would be treating, meaning that they would be identified as foreign invaders and thus rejected. Only by suppressing this immune response could the ESCs be accepted, but clearly this would leave the patient susceptible to all sorts of diseases.

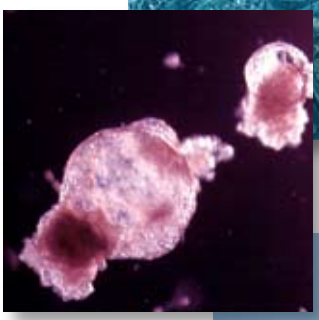
Benvenisty has already studied the process which makes ESCs trigger an immune response and is now looking at what he calls "genetic tricks" to overcome this problem. "The research with human ESCs is getting closer to clinical trials," he says.

However, it is in the field of human genetic disorders that Benvenisty and his team have achieved their latest breakthrough, as published in *Cell Stem Cell* in November 2007. They have been studying ESCs that carry the genetic mutation for Fragile X, the most prevalent reason for hereditary mental retardation in boys. It is well known that the problem is caused by the failure of brain cells to produce a particular protein. This mutation silences the gene containing the essential instructions that trigger production of the protein.

Using a new model in human ESCs, Benvenisty's lab has shown that the mutated gene is still active during early embryonic development and becomes inactive only upon differentiation. The research may now allow for the screening of drugs that prevent gene inactivation.

Undoubtedly, ESC research at the Hebrew University is at the threshold of the most amazing medical advances. "While the 20th century belonged to DNA, the 21st century belongs to cells," says Prof. Benvenisty. "Stem cells are the heart of cell research — and embryonic stem cells are the Holy Grail." ■





From top: Embroyonic cell colonies (blue), human embryoid bodies (pink), a cell is removed from an eight-cell embryo in order to screen for genetic testing

Prof. Nissim Benvenisty (seated, center) with students and team members of the Stem Cell Unit and the Embryonic Stem Cell Bank, established at the Faculty of Science with the support of the Legacy Heritage Fund

Sasson Tiram

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Routes to Roots

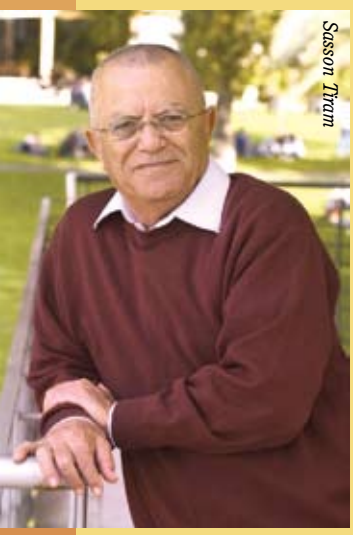
An integrative approach to uncovering the origins of East European Jewry may reveal a world that has left few physical traces

By Shelley Kleiman

THE theory that Jews of Eastern European descent are of Germanic — that is Ashkenazi — origin is almost universally acknowledged as a truth. Like some other scholars, Judeo-Slavic researcher Dr. Alexander Kulik of the Department of Russian and Slavic Studies and vice-chair of the Chais

Shared Genes

Prof. Jossi Hillel



Sasson Tiram

While developing methods for the application of DNA markers in breeding programs, and detecting and mapping important genes in chickens, Professor Jossi Hillel has also been researching the origins of the Jewish people and closely related groups. A member of the Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture, Hillel — as comfortable quoting the Bible as discussing DNA markers — has been analyzing genetic similarities between several ethnic groups in Israel, including Ashkenazim, Yemenites, Moroccans, Libyans, Iraqis, Ethiopians, Palestinians, Druze and Samaritans.

"I always wanted to unravel the common denominator of all Jewish ethnic groups and understand why they bear a greater resemblance, in appearance and behavior, to their host populations than to the other Jewish ethnic groups," says Iraqi-born Hillel. He has supervised two masters theses in this field and collaborates closely with Professor Marc Feldman of Stanford University, who was conferred an honorary doctorate by the Hebrew University in 2005.

Based on the analysis of Y-chromosome microsatellites — markers for origin "which essentially remain the same even after thousands of years" — Hillel says that almost all Jewish populations can trace their origins back to the same ancestral male Israelite gene pool. In contrast, when non-Y chromosome information — markers for events that took place in the Diaspora such as intermarriage and conversion to Judaism — was analyzed, the ethnic groups were clearly distinguishable from one another, probably due to gene flow from the host populations.

Take the Samaritans, today numbering some 640 people but comprising over one million members in late Roman times. While culturally different from Jewish and non-Jewish populations in the region, genetic studies suggest that, in terms of their origin, Samaritans have much more in common with Jews than with

Center of Jewish Studies in Russian at the Mandel Institute of Jewish Studies says this is far from accurate. Indeed, he is combining both traditional and innovative research approaches to explore the true origins of Eastern European Jews, whose progeny accounts for a majority of contemporary world Jewry.

The "common knowledge theory," as Kulik describes it, holds that during the Middle Ages Jews from Germany immigrated en masse to Poland, the "then-land of opportunity", later partitioned between Austria, Prussia and Russia in the 18th century. This "fact" seemed obvious since modern-age Jews living in these territories spoke Yiddish and shared the religious and cultural traditions of Ashkenaz.

There are numerous historical loopholes in this theory, says Kulik. "Most significantly, there is evidence of a Jewish presence in these lands dating back to at least the early Middle Ages — long before the incursion of German Jews can be documented."

The real mystery, however, lies in unraveling the origin of these early medieval communities. Can they, to list the prevalent theories, be traced to Byzantium, Persia or to the converted local Turkic tribes of Khazars? There is, says Kulik, little historical or physical evidence to substantiate any of these claims — plus even less academic consensus. To further complicate this scholarly puzzle, "loaded" questions regarding ethnic and sub-ethnic identity often invite "ideological, extra-academic interpretations," says Kulik. For example, an attempt to trace Eastern European Jewry to the Khazars, who converted to Judaism in the 8th-9th centuries, has been used "by anti-Zionists to disclaim any Jewish connection to the Land of Israel.

"An understanding of the origin and the cultural characteristics of Eastern European Jewry depends on an evaluation of the Jewish presence in the region before the migration of German Jews," says Kulik, editor-in-chief of the

Sasson Tiram

Studia Judaeoslavica series (published by Brill). But traditional historical scholarship has gone as far as it can. "Direct, primary evidence of Jewish life in the Middle Ages and earlier is scarce," he says.

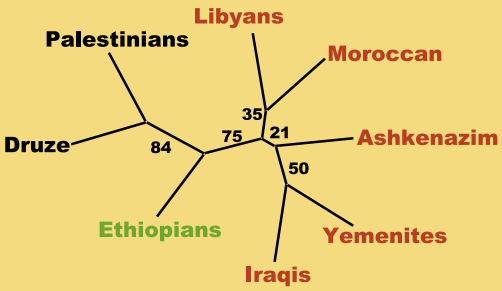
"That means using innovative, multidisciplinary approaches as encompassed by three diverse research directions: historical-philological, linguistic and genetic studies." And where better to do this than at the Hebrew University where the basis has been created by eminent scholars: historians such as Faculty of Humanities Dean Professor Israel Bartal and the late Professor Shmuel Ettinger; philologists such as professors Moshe Taube and Cyril Aslanov and the late Professor Moshe Altbauer; and genetic experts such as Professor Jossi Hillel and Dr. Marina Faerman (see sidebars).

KULIK'S expertise lies primarily in the historical-philological approach.

Dr. Alexander Kulik

A tenth-century Hebrew document (opposite) found in the Cairo Genizah (Cambridge University Library, T-S12.122) and written by the Jews of Kiev provides proof of the existence of a Jewish community in Kiev in the Middle Ages

their Palestinian neighbors. As shown by Hillel's results, this would indicate that not all Samaritans went into exile when the Assyrians conquered the northern kingdom of Israel in 722 BCE. "This partial similarity," says Hillel "clears up a historical-biblical ambiguity between the Samaritans' claim to be descended from the children of Israel and Kings II (17:24) which says: 'And the king of Assyria brought men from Babylon, and from Cuthah, and from Avva, and from Hamath and Sepharvaim, and placed them in the cities of Samaria instead of the children of Israel; and they possessed Samaria, and dwelt in the cities thereof."



Almost all ethnic Jewish groups are indistinguishable, as shown in the neighbor-joining tree where branch length and distance indicates level of relatedness

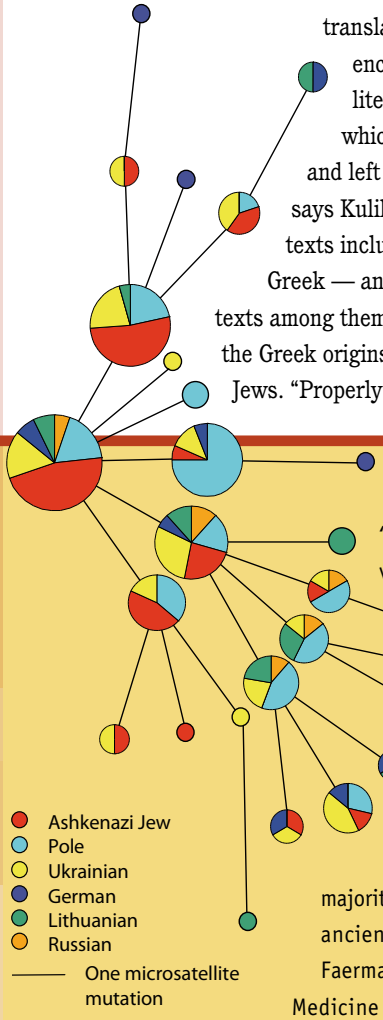
With a command of many ancient and modern languages, he is engaged in examining source material previously considered irrelevant.

These are not newly discovered sources, but rather material that Kulik defines as "non-direct evidence," with "a relative abundance of Slavic sources indicating the presence of Jews in the region." These "non-Jewish, non-traditional" sources, mostly translations into Slavic, encompass years of literary production in which Jews participated and left their cultural mark, says Kulik. The original texts include Hebrew and Greek — and the Greek-Jewish texts among them, he says, hint at the Greek origins of some of these Jews. "Properly analyzed, ancient texts can shed light on the cultural characteristics of their authors and readers," says Kulik.

"Likewise, language can preserve extremely ancient elements that reflect the origins of its speakers." Even Yiddish which, as a Germanic vernacular, was assumed to prove the Ashkenazi roots of its speakers offers insights. "As shown by the late Max Weinreich of YIVO, and more recently by the Hebrew University's Prof. Aslanov, Slavic elements in Eastern Yiddish go back to a very ancient stratum, probably testifying to the existence of Slavic-speaking Jewish communities. This is highly significant in the reconstruction of Eastern European Jewry's cultural origins," says Kulik, adding that the history of cultural divergence within Eastern European Jewry is another promising area for integrative research.

'ancient texts can shed light on the cultural characteristics of their authors and readers'

Kulik hopes that combining history, philology and regional studies might reveal a world that has left little physical traces. The goal, he says, is not only to prove whether or not these Jews were of Ashkenazi origin, but also to answer numerous basic questions about Jewish identity, cultural history, patterns of inter-communal assimilation, migration and more. "Integrating our approaches, and bringing in fields such as genetics, would undoubtedly uncover new data," he says. "We may even end up with more answers than we have questions." ■



Ancient Footprints

"Analysis of present-day human Y-chromosome variation allows us to trace paternal lineages into the past," says biological anthropologist Dr. Marina Faerman who combines traditional anthropological methodologies with those of modern population genetics to study the origins of the Jewish people and other populations in the Middle East. "Indeed, genetic studies confirm that the majority of contemporary Jews are descendants of the ancient Israelites that lived in this region," says Faerman, a Kameah Fellow at the Faculty of Dental Medicine and a member of a team analyzing the Y-chromosomal markers in Israeli populations.

"Sephardic, Ashkenazi and Kurdish Jews have a common Mid-East origin which can be traced back some 9,000 years to Mesopotamia. Moreover, they share a high occurrence of the Cohen Modal Haplotype, a genetic signature for the paternally inherited Jewish priesthood," she says. "Jews are also closely related to other groups in the Middle East, in particular their Arab neighbors.

"Our research shows that Kurdish and Sephardic Jews are almost indistinguishable from each other but differ slightly from Ashkenazim," says Faerman, who immigrated to Israel in 1990 following several years of research at Moscow State University. "Since Diaspora communities were geographically separated for hundreds of years, divergence due to genetic drift and/or admixture with other populations could be expected," she says. "However, the Y-chromosome composition of Israeli Ashkenazim differs significantly from that of their former hosts in Europe, thereby implying low levels of admixture. We have nevertheless identified a specific Y-chromosome of Eastern European origin that was introduced into the evolving Ashkenazi community by a single founder or a few closely related men. It accounts for 9-12 percent of present-day Ashkenazi males and might well be a vestige of the mysterious Khazars."


Dr. Dori Filon

Dr. Marina Faerman (right) and her colleagues have identified a single Y chromosome of Eastern European origin that accounts for 9-12 percent of present-day Ashkenazi males

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