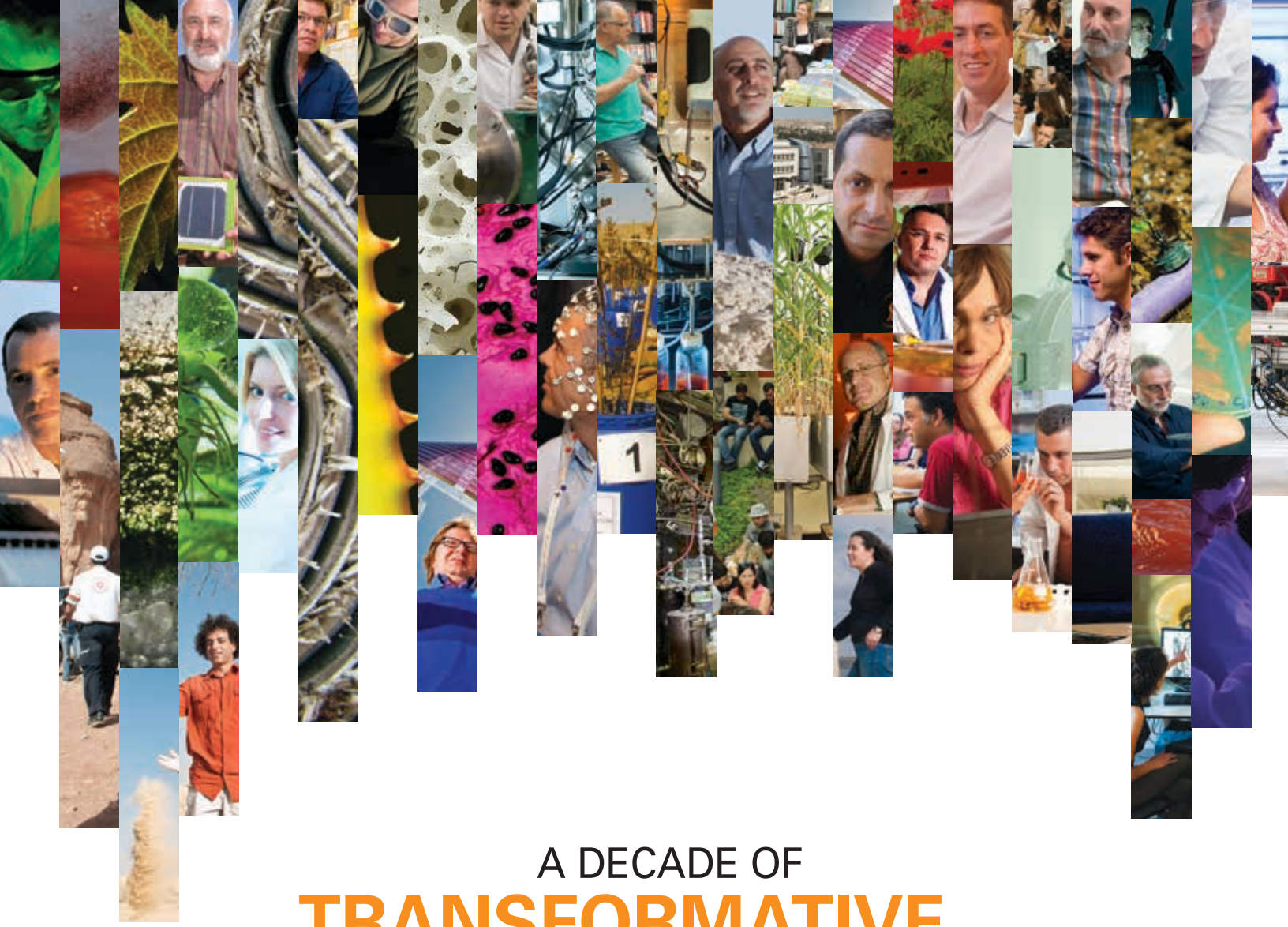

# A DECADE OF TRANSFORMATIVE RESEARCH AT BEN-GURION UNIVERSITY OF THE NEGEV

APRIL 2014

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

"Understanding the secrets of nature will be our greatest endeavor."

David Ben-Gurion




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# From the President

## Prof. Rivka Carmi

Dear Friends,
Research is at the heart of the academic endeavor. It starts with a spark of curiosity, a question that cannot be answered, and the commitment to seek the answers that push out the boundaries of our existing knowledge.

Ben-Gurion University of the Negev was shaped in many ways by its unique desert location in the heart of Israel's most diverse region. Its small size, warm atmosphere, and pioneering spirit encouraged unexpected interdisciplinary collaborations. In retrospect, what started through necessity, and a shortage of resources, has positioned BGU at the forefront of a number of developing scientific and scholarly fields.

Through a concerted, sustained, and determined effort over the past 10 years, we have worked to transform our research capacity. We have invested in state-of-the-art infrastructure, expanded our physical facilities and, most importantly, hired the very best researchers. We have provided them with the tools to search for answers – to basic scientific questions and to the challenges of the modern age, from industry to the human condition.

We have worked to attract exceptional research students from Israel and around the world, creating an international community that encourages collaboration and strives for excellence. And we have succeeded, as evidenced by the increase in our ability to obtain prestigious peer-reviewed research grants and partnerships with leading universities around the world.

All this has been made possible through the team effort of a community focused on one goal – to do the very best research possible – and through the efforts of a true leader: a top scientist who embarked on a relentless quest for excellence in research and with fierce determination and hard work has brought research at BGU to new heights and impressive accomplishments. I am grateful to Prof. Moti Herskowitz, Vice-President and Dean for Research and Development, without whom we would have never made this leap from good to great.

Thank you,

Rivka

Prof. Rivka Carmi, MD
President

# A Decade of Transformation

## Prof. Moti Herskowitz, Vice-President and Dean for R&D

*http://in.bgu.ac.il/en/vpdrd/Pages/default.aspx*

*Prof. Moti Herskowitz*

Research drives the frontier of knowledge forward, embracing local and global issues and fostering a sustainable future. Promoting advanced research that strives for excellence in innovation and scholarship is a challenging, multi-task endeavor. Such an undertaking should recognize the diversity of scientific and scholastic topics while emphasizing the importance of inter-disciplinary research and a critical research level of activities in specific topics.

**Ben-Gurion University of the Negev (BGU)** is a young, comprehensive university that was established with the mission to promote the development of the Negev, the largest yet most underpopulated region of Israel. Today, the University has five campuses located from the northern end to the southern tip of the Negev – three in Beer-Sheva (including the main campus), one in Sede Boqer (the 'desert research' campus), and one in Eilat. BGU has grown from a small local institute of higher learning into a globally recognized university, hosting the most advanced topics of research, with a significant impact on progress in the sciences and technology and the humanities. This transition has accelerated over the past decade, as reflected in the dramatic change in the culture of research, the infrastructure, and the support provided to newly recruited researchers, accompanied by a significant increase in scientific publications and budgets. The transition is particularly evident in the rapid penetration of the research effort into advanced fields at the frontier of science and technology, such as cyber security, robotics, drug discovery, and functional bio-polymers, all with unprecedented accomplishments. The establishment of new research institutes, centers and laboratories, along with the upgrading of existing research units, has made a major contribution to inter-disciplinary research. The emphasis on applied research – adopted by BGU from the very beginning – has been intensified by exploiting advanced fundamental research to advance the so-called use-inspired research.

**The Office of the Vice-President and Dean for Research & Development** is responsible for supporting, managing, and promoting all research activities at BGU. While diversity of research is fundamental to ensure a balanced environment for academic learning, emphasis is placed on foci of uniqueness and excellence. In this context, internal funding is provided to specific research initiatives where necessary. Newly recruited researchers receive personal research facilities and a generous start-up package, based on their specific needs, allowing them to start their research activities while applying for external grants. Research progress could not have been possible without the dramatic improvement in the physical infrastructure, the library, and the equipment that has taken place during the past decade. Today, the researchers and scholars of BGU enjoy state-of-the-art facilities that support cutting-edge research.

**Research Institutes and Centers** provide fertile ground for promoting inter-disciplinary research in both the sciences and the humanities, as described herein. The establishment of the Ilse Katz Institute for Nanoscience and Nanotechnology, the Homeland Security Institute, and the National Institute for Biotechnology in the Negev, all with advanced infrastructure, have created the framework for the promotion of specific areas of research. The three research institutes comprising the Blaustein Institutes for Desert Research that focus on renewable energy and the environment, desert agriculture, biotechnology, and water research have recorded outstanding research accomplishments in advancing a sustainable future. Heksherim – the Research Institute for Jewish and Israeli Literature & Culture, the Jacques Loeb Centre for the History and Philosophy of the Life Sciences, and

the I-CORE Center for the Study of Conversion and Inter-Religious Encounters have recorded excellent achievements in interdisciplinary research in the humanities. The Bengis Center for Entrepreneurship and Hi-Tech Management serves as a catalyst to create and channel innovation and entrepreneurial activity. Cyber security research at BGU, with Telekom Innovation Laboratories at its core, has achieved unparalleled accomplishments and world-wide recognition.

**Collaboration** with world renowned universities is a significant vote of confidence on the level of our research. Just recently, research agreements were signed with the University of Michigan in the area of renewable energy and with the University of Chicago in the area of water research. Eight joint two-year projects have been initiated this year, with more to follow in the coming years.

**The Research & Development Authority (RDA)** has reinvented itself to keep pace with the rapidly changing international academic community and to raise BGU's success rate in garnering highly competitive funding. The Authority has streamlined and upgraded its services to ensure that researchers are able to compete effectively for the most prestigious, peer-reviewed grants. With the aim to diversify the resources available, new priorities were identified in terms of obtaining increased funding from specific sources; more intensive and readily available in-house consulting was provided; grant-writing workshops were offered; and an online bank of successful past applications was created. A new mentoring program was launched, in which new researchers were paired with successful senior researchers, who brought their experience to bear in advising the new faculty on preparing high-quality applications. Having found that researchers also need a closer support system within their faculties, a new position of research support referee was set up at the faculty level. Changing the way researchers perceive the grant application process has already proven effective, both in increasing the numbers of proposals submitted and in the success rate. The total external research funding has more than doubled from 39.5 million dollars in 2003/4 to 82 million dollars in 2012/13. High standards of financial management and compliance with the demands of the foundations and of University and national regulations have resulted in satisfactory audits by external auditors and in the completion of projects without deficits.

**BGN Technologies**, the technology transfer company of BGU, is responsible for the commercialization of know-how and innovative technologies created by the University researchers. It creates partnerships with industry and investors to bring value to the technological marketplace, to the University and to its researchers. BGN Technologies promotes R&D at BGU through sponsored research, technology licensing, and the establishment of start-up companies. It plays an important role in regional economic development through activities such as the establishment – together with business partners and local municipalities – of Capital Nature (a Technology Center for Renewable Energy) and Bio-Negev (an umbrella organization that promotes the bio activities in the region). The growth of BGN Technologies over the last decade is impressive. With hundreds of license agreements, a patent portfolio that is eight times larger, a fourfold increase in the dollar value of sponsored research, and a tenfold increase in the value of royalties, the company is headed into a promising future.

**BGU's vision for the future** is to continue to strengthen its national and international research profile as a globally renowned institution by promoting advanced fundamental research and searching for potential applications through the recruitment of excellent researchers, increased R&D budgets, enhanced national and international cooperation, and an improved research infrastructure.

# Ilse Katz Institute for Nanoscale Science and Technology

## Prof. Yuval Golan, Director

*http://in.bgu.ac.il/en/iki/Pages/default.aspx*

### The IKI Today – A World-Class Research Institute and Key Research Support Facility of BGU

Our vision for the IKI is to establish a world-class center for nanotechnology research & development, thereby benefiting the Negev, the State of Israel, and society as a whole. The research mission is to promote, enable and support innovative nanoscale research at BGU. The IKI recruits and supports leading researchers; establishes and operates the necessary research infrastructure; promotes industry-academia cooperation to focus and implement the research; develops interdisciplinary research interactions through seminars and workshops; and raises the necessary funding for the execution of its mission. The Institute thus brings together under one roof a community of scientists working on a variety of subjects that are related to the understanding and manipulation of matter at nanoscale dimensions, including energy conversion and storage, nanophotonics, nanobiotechnology, nanomedicine, biophysics, water purification & desalination, biological & chemical sensing, quantum science & technology, thin films, and nanomaterials. The IKI also provides state-of-the-art facilities for nanoscale fabrication and characterization for the benefit of the entire academic and industrial research community in the Negev.

### Ten Years of Transformation

The IKI has progressed from a small research center to a flagship university research institute. In 2010, the IKI moved to its new, custom-designed building, constructed with a major investment of 84 million NIS from the University. Operating under the National Nanotechnology Initiative of the Israel Government, known as the INNI, the IKI is today home to 65 faculty members and their research groups, who are drawn from all relevant faculties of the University, including engineering sciences, natural sciences, health sciences and water research. The strategy of BGU management to invest in infrastructure was put into practice first in the building of the new premises and thereafter in the purchase of the necessary state-of-the art equipment, including electron microscopes, spectrometers and diffractometers. By housing this equipment in a single facility, which provides the academic, technical and operational support for the equipment, the IKI is thus able to ensure the maximum possible utilization of the equipment by BGU researchers, as well as by external academic, industrial and government users throughout the country.

A new organizational structure has recently been put in place, with the Institute's Director reporting directly to the Vice-President and Dean for R&D. Coherent with the vision of the Institute to promote cutting-edge research in nanotechnology, a number of completely new laboratories have been established, and others have been upgraded. In parallel, some equipment (environmental scanning electron microscope, chromatographs, and thermal analyzers) has been relocated to the IKI from facilities on other BGU campuses. As a result, the IKI now offers front-line facilities and expertise in analytical transmission electron microscopy, scanning probe microscopy, total internal reflection fluorescence microscopy, electron paramagnetic resonance spectroscopy, Fourier transform infrared spectroscopy, and X-ray scattering & X-ray fluorescence spectroscopy. The nano-fabrication facility is currently operating under a full-time manager and a full-time administrator and has proved to be an important success: In addition to providing high level nano-fabrication services to the BGU research community, the nano-FAB, by virtue of the expertise and how-how of its staff, has generated millions of shekels of revenue from industrial and government contracts over the past few years.

### Research Horizons

In the years to come, the IKI expects to continue leading cutting-edge research in nanotechnology and providing state-of-the-art research facilities to BGU researchers and the scientific and industrial community at large. The nano-FAB will continue


ILSE KATZ INSTITUTE FOR NANOSCA
SCIENCES AND TECHNOLOGY

to provide design, prototyping and fabrication services to industry and to the scientific community. All research support facilities will continue to be serviced and upgraded to secure their enabling role in promoting research at BGU.

## International recognition

Prof. Yoav Tsori was elected to the Young Academy of Europe (YAE); Prof. Smadar Cohen was selected by Lady Globes as the 26th of 50 most influential women; and Prof. Joseph Kost was elected Foreign Associate of the United States National Academy of Engineering (NAE).

*Prof. Yuval Golan*

Prof. Yuval Golan, Director of the IKI and member Department of Materials Engineering, is active in the area of nanomaterials and thin films. His research focuses on the interactions between crystalline inorganic materials and organic molecules and on how the latter can be utilized for controlling the size, shape, orientation and assembly of nanoscale inorganic crystals. He has published over 100 peer reviewed publications, many of them in top-notch journals, such as Nature Materials, Nature Physics, MRS Bulletin, Journal of the American Chemical Society, Nano Letters, Langmuir and others. His work has been presented in some 180 papers at scientific conferences in Israel and abroad. Golan has received two BGU prizes for excellence in research—the Toronto Prize for Outstanding Young Researcher in 2007 and the President's Prize for Outstanding Researcher in 2009. He is a member of the Synchrotron Committee of the Israel Academy of Science and Humanities.

*Prof. Gabby Sarusi*

Prof. Gabby Sarusi, a member of BGU's IKI, Homeland Security Institute and Unit of Electro-Optical Engineering, joined BGU in 2012 after 17 years in senior research positions at Elbit Systems Ltd (Elop-Elbit). At Elop, he was in charge of developing the next generation of thermal imaging night vision systems and airborne- and space-borne cameras. In addition to night vision devices, Sarusi's research interests include semiconductors, quantum phenomena, and band gap engineering. At present, he is fully dedicated to leading the interuniversity team that is working on the INNI project described in the box—developing a revolutionary night-vision coating for glasses.

Prof. Joseph Kost, Dean of the Faculty of Engineering Sciences and member of the IKI and of the Department of Chemical Engineering, has made significant contributions to the field of biomedical engineering. He was the first to propose ultrasonically modulated systems in which the release of drugs from polymers or through synthetic or biological membranes can be repeatedly modulated at will from a position external to the delivery system. Based on Kost's pioneering technology for ultrasound-controlled transdermal (through the skin) drug delivery as an attractive alternative to the injection of drugs, several companies have been set-up. One of these, Sontra Medical (now Echo Therapeutics), developed SonoPrep®, the first non-invasive ultrasound-based device for delivering drugs (lidocaine) through the skin. The FDA-approved SonoPrep system was named the "most important medical advance of 2004" by Popular Science.

# The IKI is currently leading two flagship projects funded by the Israel National Nanotechnology Initiative (INNI)

The IKI is the only nanotechnology institute in Israel to receive funding for more than one flagship project.

"Bio-inspired nano-carriers for sub-cellular targeted therapeutics" – led by Prof. Joseph Kost – focuses on packaging drug molecules into nanometer-size vessels that are capable of identifying and entering the particular cells in which they are to release their contents. This project is conducted by researchers with expertise in disciplines ranging from chemical and biotechnology engineering, through chemistry, to medical sciences.

"Integrated infra-red upconversion devices using nanoplasmonic materials and nanophotonic structures" – led by Dr. Gabby Sarusi – utilizes advanced nanomaterials for producing a completely new night-vision apparatus with an overall device thickness of a few microns. The project is based on up-converting infrared radiation into visible light by combining expertise in materials engineering, electro-optical engineering, nanotechnology, nanophotonics, physics and chemistry.


*Prof. Joseph Kost*

Kost has received numerous prizes for his research—in 1996, the Technion-Israel Institution of Technology's Juludan Prize for outstanding scientific research; in 1999, the Clemson Award from the US Society for Biomaterials in recognition of his outstanding contributions to applied biomaterials research; in 2005, the Jacqueline Seroussi Award for Cancer Research; and in 2008, BGU President's Prize for Outstanding Scientific Achievements. Kost has been a Fellow of the American Institute for Medical and Biological Engineering since 1998. In 2007, he was elected a Foreign Associate of the National Academy of Engineering of the United States of America, and in 2012, he was nominated an Honorary Fellow of the Institute of Chemical Engineers.

At present, Kost is leading several funded projects, including one that is being carried out in collaboration with Johns Hopkins University with funding from the BSF (Binational Science Foundation US-Israel), and another that is underway in collaboration with the Cincinnati Children's Hospital Medical Center. He is also leading three major programs funded by Israel government ministries: a Magnet Consortium developing anti-microbial and anti-fouling packaging films, the INNI project on bio-inspired nano-carriers, described in the box, and a project to develop a topical therapeutic agent for psoriasis.

Prof. Yoav Tsori, of the Department of Chemical Engineering, works in the field of soft matter physics. In recent years, he discovered a new family of phase transitions occurring in liquids and polymers in spatially non-uniform electric fields. His group is currently investigating, both theoretically and experimentally, the fundamental aspects of this transition and their application to microfluidics flow and chemical reactions. In addition he researches such diverse phenomena as heating in nanopores, the Hall effect in flowing electrolytes, block copolymers, interfacial instabilities in liquids, and protein crystallization.

Tsori was recently elected to the Young Academy of Europe (YAE). He is a recipient of the prestigious ERC starting grant, which he is using for breakthrough research on electric fields in liquids. He is also is a recipient of the Wolf Fund Krill Prize for excellence in research and has been a Joliot Curie and Michelin visiting professor at ESPCI, Paris.


*Prof. Yoav Tsori*

# Prof. Smadar Cohen, a role model for use-inspired research and innovation

Prof. Smadar Cohen is the founder and the director of the BGU Center for Regenerative Medicine and Stem Cell Research. She is a member of the IKI and of the Avram and Stella Goldstein-Goren Department of Biotechnology Engineering, of which she was the founding head. Cohen's research focusses on the advancement and development of critical research tools for promoting regenerative medicine as a therapeutic strategy for previously untreatable diseases. Her research includes: the design of bio-inspired materials for tissue regeneration and engineering, the development of advanced perfusion bioreactors, and implementation of intelligent nano-sized delivery systems for therapeutics. The hallmarks of her research are high quality, the interdisciplinary nature of her experimental approaches, and the creative application of ideas and tools from a number of different disciplines. The creativity and novelty of her research is exemplified by a remarkably strong patent portfolio (24 granted and 6 pending US patents) in addition to an excellent publication record (>100 papers in refereed journals).

Among the most significant of Cohen's patents is the one for the BL-1040 alginate injection of the BiolineRx series, which prevents the heart's further deterioration (cardiac remodeling) after a heart attack. Clinical testing has begun on BL-1040. The material is administered via a catheter – a novel delivery method for biomaterials – as soon as possible after a heart attack and dissolves naturally with time while the heart muscle is healing. Cohen developed the alginate material in her laboratory, and preclinical studies were performed together with Prof. Jonathan Leor, Director of the Neufeld Cardiac Research Institute at Tel Aviv University. The device is based on a new concept in biomedical research formulated by Cohen—that biomaterials can affect biological processes inside or outside our body, by giving 'instructions' that lead to tissue/organ regeneration and healing.

The quality of Cohen's research is also reflected in the awards granted to her: The Rappaport Prize for excellent achievements in bio-medical research (2010); the ICRS Award for Outstanding Achievements in Controlled Release in recognition of her pioneering work in the field of controlled release in tissue regeneration technologies (2010); BGU President's Prize for outstanding scientific achievements in applied research (2010); The Teva Founders Prize for research in bio-medical sciences and application of biomaterials for regenerating tissues (2009); BGU's Outstanding Researcher Award (2006); The Juludan Prize from the Technion for biomedical research (2002); the Controlled Release Society's Award for the Best Pharmaceutical Paper (1991), and the Wolfson Research Award of the Israel Academy of Sciences and Humanities (1993).

# Homeland Security Institute

## Prof. Dan Blumberg, Director

*http://in.bgu.ac.il/en/hsi/Pages/default.aspx*

### Mission and Objectives

The mission of the HSI is to promote cooperative research on homeland security in its broadest sense within BGU and with other research entities and relevant industries and funding agencies on a regional, national, and international scale. The HSI is made up of several research centers that deal with security-related themes that are relevant to the virtual homeland, to the physical homeland, and to emergency and rapid response, as described below.

### Autonomous Systems

Very often, homeland security tasks have to be carried out in the face of daunting challenges and dangerous environments. The field of robotics and autonomous security-related systems is an area of proven strength at BGU, as evidenced by all recognized benchmarks (competitive research grants, collaboration with industry, DARPA challenges, AUVSI RoboSub Competition, and publications). BGU scientists are developing autonomous capabilities for a wide variety of air, water and sea platforms to reduce the need to send people into dangerous situations. Research is conducted in such diverse areas as: mechanical design, real-time processing, hardware, software, navigation, control, sensors, perception, and recognition.

### Imaging and Remote Sensing

Remote sensing, be it from the air, from space, or on the ground, provides the capability to observe areas from a distance. In addition, state-of-the-art imaging systems can acquire information way beyond the visible spectrum in narrow or broad spectral bands. These capabilities may be exploited for environmental monitoring, disaster response, and security, and for the protection of facilities, infrastructure, and borders. The research at BGU covers all levels of signal processing and bio- and geophysical information extraction, including mapping, target detection, and anomaly detection. Researchers from the departments of Geography and Environmental Development, Electrical and Computer Engineering, Electro-optical Engineering, Computer Sciences, and Solar Energy and Environmental Physics are developing novel approaches for the analysis of hyperspectral, multispectral, and radar images, and image restoration and registration. The BGU Team achieved the highest score in the internationally recognized Target Detection Blind Test of the Rochester Institute of Technology (which prepares the test together with the United States Air Force Research Laboratory). In addition, BGU has initiated a program to build its own pico satellite together with Israeli industries.

### Structural Resilience and Stability

Researchers from the Departments of Mechanical Engineering and Structural Engineering and the Protective Technologies R & D Center bring their complementary expertise to bear in such specialized fields as: protective technologies; resilient structures; ammunition and explosives safety; blasting and fragmentation; shock loading; structural dynamics; and fracture mechanics. Research is translated into practical applications for earthquake resilience, structural resistance against blasts and explosions, and dynamic protection against medium-range rockets and artillery shells with so-called super-quick (SQ) fuses.

### Cyber Security

BGU has developed into a cyber-security powerhouse, addressing a full range of research topics that are described in greater detail on the following pages.

### Sensors and Related Applications

BGU's research in homeland security also covers the development of novel sensors (including biosensors) and biochips with security-related applications. Other developments include magnetic sensors with high sensitivity, atom chips, and compressive sensing imaging devices, which can be used, among other applications, for border security, infrastructure security and safe cities.


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## Emergency and Disaster Response

PREPARED, the BGU Center for Emergency Response Research, conducts research on preparedness for a wide range of mass casualty scenarios, including natural and other unintentional disasters, terrorism, and acts of war (conventional and unconventional). The Center, having acquired expertise in both pre- and post-disaster assessment (including practical, policy, and ethical aspects) and intervention is well positioned to play its part in the activities of the HSI.

## Water Security

Water security is addressed by the chemists, chemical engineers, hydrologists, and microbiologists of BGU's Zuckerberg Institute for Water Research (ZIWR). The research is aimed to develop measures for ensuring that the population of Israel and populations of drylands globally have adequate water supplies and water quality for their personal needs and for sustainable development.

## Research Horizons

Security will always be an issue of concern for many aspects of society. The HSI will therefore need to its broaden its research horizons and to maintain the flexibility to include researchers from additional departments across the campus as it identifies new needs and new areas of research relevant to these concerns. In addition, it will continue to serve as a magnet to draw new industries to the Negev, as is already beginning to happen in the Advanced Technologies Park associated with the University.

Prof. Dan Blumberg, the current Deputy Vice-President and Dean for Research and Development, is a member of the Department of Geography and Environmental Development, where he is director of the Earth and Planetary Image Facility (a NASA regional planetary image facility at BGU). His research interests in aeolian processes (wind-blown sand transport and deposition) and microwave radar and hyperspectral remote sensing and his collaboration with scientists from BGU's Faculty of Engineering and The Blaustein Institutes for Desert Research have helped to establish BGU as a world-renowned research institute in remote sensing.

While Blumberg's core research interest focused on remote sensing for the study of arid zone

*Prof. Dan Blumberg*

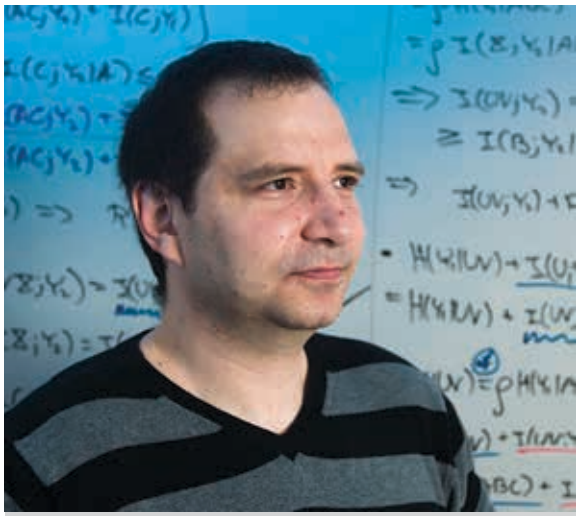
environments and planetary geology, his work has since evolved to cover other applications, including homeland security, in which he has published on anomaly and target detection, rapid response, and situational awareness. As director of the Homeland Security Institute, Blumberg has promoted security-related R&D on remote sensing, autonomous robotics, cyber security, physical structure resilience, emergency medicine and social resilience. Blumberg has also been instrumental in developing the cyber ecosystem surrounding BGU.

In international collaborations, Blumberg has conducted research with Arizona State University, the Space Radar Laboratory (NASA's SIR-C Mission), and the German Space Agency. He has also served as principal investigator of numerous research projects for the Israel Space Agency. Funding for this R&D activity was obtained from competitive research grants from the European Union, the United States European Office for Research and Development, the Israel Space Agency, the Israel Ministry of Science (infrastructure grants), and the Israel Ministry of Defense.

In addition to his research activities, Blumberg is also responsible for establishing the Green Campus Initiative at BGU, which has garnered the support of the entire university community, including the academic faculty, the branches of logistics and management, and the students. Indeed, last year "Green Metrics" listed BGU as being among the 50 leading green higher education institutes worldwide.

Prof. Hugo Guterman is a member of the Department of Computer and Electrical Engineering and head of the Laboratory for Autonomous Robotics (LAR). Due to the complexity and interdisciplinary nature of the laboratory's research, close collaboration is required between researchers and students from different disciplines. With the underlying goal of realizing the potential of the robotics field, the multidisciplinary LAR team has achieved many successes in the fields of defense, space-related robots, cognition, computer vision and graphics, anthropomorphic robots and, particularly, autonomous vehicles, including unmanned aerial vehicles (UAV), unmanned ground vehicles (UGV), and unmanned sea and underwater vehicles (UUV). The excellence of the LAR is reflected in BGU's successful participation as a member of Team Avant-Guardium in the DARPA Urban Grand Challenge. The LAR also led Robil, a consortium of members from the Israeli robotics industry and academia, which was the only foreign team accepted to participate in DARPA's Robotics Challenge on Track B. Recently, the LAR has developed the Hydro Camel, the first Israeli autonomous submarine, which participated in the AUVSI RoboSub 2013, held in San Diego, USA.

*Prof. Hugo Guterman*



Prof. Haim Permuter investigates directed information, a new measure in information theory. With this measure, problems with causality constraints can be solved in various fields, such as physics and economics. Specifically, it is possible to find the fundamental limits of bidirectional communication, such as in communication systems with feedback: Given two processes, it is possible answer the question of what causes what. For instance, the question "Does the stock market in the USA influence the stock market in China or vice versa?" can be answered.

Permuter leads a group studying information and communication theory in the Department of Electrical and Computer Engineering. His research focuses on information theory and its application to wireless communication. He is the recipient of several awards, including Eshkol Fellowship, Wolf Award, Fulbright Fellowship, Stanford Graduate Fellowship, Alon Fellowship, the BGU Toronto Award, and the 2009 U.S.-Israel Binational Science Foundation Bergmann Memorial Award. Recently, Permuter was awarded the very prestigious the European Research Council (ERC) Starting Grant.

# Cyber Security Initiative

## Prof. Yuval Elovici, Coordinator

*http://cyber.bgu.ac.il/*

*Mr. Timotheus Höttges, incoming CEO, Deutsche Telekom (left), Prof. Yuval Elovici, Director, DT Innovation Labs at BGU (middle) and Mr. René Obermann, outgoing CEO, DT (right)*

### Making Cyber Space a Safer Place

National and commercial infrastructures throughout the world are vulnerable to cyber attacks and cyber terror. The research effort on cyber security at BGU is conducted under the umbrella of the Homeland Security Institute and encompasses departments across the campus, including Information Systems Engineering, Communication Systems Engineering, and Computer Science. The research is focused on the following areas:

- Big data security analytics: identifying attacks on big data collected by organizations and optimal monitoring of networks
- Combatting insider threats: collecting actionable counter-intelligence and legally acceptable evidence with the aim to contain damage caused by individuals who abuse granted privileges
- Combatting malware and botnets: reactively and proactively mitigating malware that exploits new security gaps or emerging communication and computation paradigms
- Embedded systems security: developing innovative security mechanisms for embedded systems with limited connectivity and computation power
- Situational understanding and attack attribution: developing methods and tools that make it possible to collect, present and share attack data as well as to detect, identify, and quarantine compromised systems
- Cyber intelligence: developing methods and tools for collecting intelligence from open sources (WWW), mainly from social networks
- Mobile security: developing methods to protect individual mobile devices and the cellular infrastructure, and conducting applied research that will lead to innovative solutions that identify vulnerabilities embedded in protocols and popular applications.

### Ten Years of Transformation

Cyber-security-related research has been conducted at BGU since 2004 when Deutsche Telekom (DT) and BGU embarked on a joint venture to conduct research on mobile security. This research was subsequently expanded to include other cyber security issues, and today approximately 100 researchers and students are conducting cutting-edge research on issues related to cyber security, both in the Telekom

Innovation Laboratories @ Ben-Gurion University and in the Cyber Security Labs @ Ben-Gurion University. The laboratories attract a large number of research students, many with industrial experience and many who are graduates of elite technological units of the Israel Defense Forces (IDF). Today, BGU is the acknowledged academic leader in cyber security research, bolstered by key partnerships with DT and by collaboration with many other hi-tech companies. Indeed, in light of the knowledge and innovative thinking of BGU researchers, companies such as Elbit, EMC, RSA, Verint, and recently Lockheed Martin have sought collaboration with BGU, leading to many successful cyber-security-related solutions produced in the labs. BGU labs also collaborate on security-related issues with government entities, including the Ministry of Defense, the IDF and, recently, the new National Cyber Bureau of the Prime Minister's Office, which are funding joint R&D projects aiming to provide solutions to evolving cyber threats.

Cyber research activities have now moved to new labs in the Advanced Technologies Park (ATP) associated with – and adjacent to – BGU, creating an ecosystem that – as recently declared by Prime Minister Benjamin Netanyahu – contains all the components needed to create a global leadership in the cyber field, namely, a common physical space, allowing the pooling of resources, shared technology infrastructure, and synergy of specialists, researchers and students.

## Vision for the Future

The end-products of BGU's research will continue to form the basis for: safeguards for information systems; reliable protection from unauthorized access; and rapid threat recognition coupled with system-wide preventive measures against the proliferation of infected data. Plans for the near future include the establishment of thematic laboratories, including a malware analysis laboratory, a cyber attack simulation laboratory, and a mobile security research laboratory, allowing researchers to focus on application-oriented research to develop solutions that will identify threats and strengthen defenses against cyber attacks. The goal is for BGU to become not only the leader in cyber security research in Israel but also one of the most important centers in the cyber security field in the academic world.

Prof. Yuval Elovici of the Department of Information Systems Engineering is the founder and director of Telekom Innovation Laboratories at Ben-Gurion University and the founder and head of Cyber Security Labs @ Ben-Gurion University. He conducts research in the fields of cyber security, mobile networks security, embedded systems security, social network analysis, and machine learning.

In the past ten years, Elovici has led the cooperation between BGU and Deutsche Telekom. Many of the projects for Deutsche Telekom focused on cyber security, and as a result, BGU has emerged as the leading university in Israel in this important field. Elovici has also developed strong ties and cooperative projects with the Israel Ministry of Defense and with major high-tech companies, such as RSA, Elbit, and Verint.

To provide better background for graduate students, Elovici has initiated a new master's program in cyber security, which is unique in Israel and is currently in high demand. Two of Elovici's former Ph.D. students have become BGU faculty members, thereby strengthening the University's competence in this field.

Elovici has published more than 56 refereed papers in leading journals and published over 100 papers in various refereed conferences. He has also co-authored a book on social network security and a book on information leakage detection and prevention.


*Prof. Shlomi Dolev*

## Prof. Shlomi Dolev

is the current Dean of the Faculty of Natural Sciences. He is the incumbent of the Rita Altura Trust Chair in Computer Sciences and was the founding head of the Department of Computer Sciences. His research interests include distributed computing and self-stabilizing distributed systems; cryptography and security; wireless networks and flocking swarms; optical computing; coding; complex networks; and coding of information in the brain. He has published more than 200 scientific articles in peer-reviewed journals, conference proceedings and patents. He is also author of the book "Self-Stabilization" published by MIT Press. Dolev has served on the program committee of more than 90 conferences, chairing the ACM Symposium on Principles of Distributed Computing (PODC 2014) and the International Symposium on Distributed Computing (DISC 2006), among others. He is an associate editor of the IEEE Transactions on Computers. Among all these activities, he also serves as the chair of the Inter-University Computation Center of Israel. He is the recipient of many research grants from industry and prestigious funding agencies, including IBM faculty awards, Intel academic grants, Verisign, Israel Science Foundation (ISF), the US National Science Foundation (NSF), and the EU FP7 Programme.

## Prof. Ehud Gudes

of the Department of Computer Science specializes in database systems, with focus on data mining and data security and privacy. His research has been published in several top-notch peer-reviewed journals and conference publications, including the distinguished database journal, TODS. Gudes is currently the recipient of an IBM grant for research on improving the performance of data mining algorithms in the cloud environment and a grant from the industry-academia MAGNET program of the Israel Ministry of Industry, Trade and Labor to detect advanced malware. Gudes was one of the founding members of the Deutsche Telekom Laboratories at BGU and in that capacity has led


*Prof. Ehud Gudes*

several projects in the network and data security areas. In recognition of his expertise in database security, Gudes has served, on numerous occasions, as the Program Committee Chair for the International Federation of Information Processing (IFIP) International Conference on Data and Application Security (DBSEC) and for the IFIP International Conference on Trust Management (IFIPTM).


*Prof. Bracha Shapira*

## Prof. Bracha Shapira

is the head of the Department of Information Systems Engineering and the founder of the Information Retrieval Laboratory. She promotes innovative personalization and profiling technologies integrated into search engines and recommender systems to create an innovative user experience for retrieval of information on the Web. She is an active entrepreneur, with several patents to her credit, and has close cooperations with several hi-tech companies, including Deutsche Telekom, EMC, Intel and Verint. Shapira has made a significant contribution to the field of cyber security by developing algorithms that are capable

of profiling terror-related behavior, protecting privacy, identifying malwares, preventing data leakage, and detecting anomalies. Shapira is the author of about 100 peer-reviewed papers in leading journals and conferences, such as JASIST, UMUAI, IEEE Transactions on Knowledge, Data Engineering, and CACM. Her publications also appear in conference proceedings, patents, and book chapters, and she has co-edited the most popular handbook of recommender systems. She is a recipient of the 2009 Rich Foundation Prize for Excellence in Research to Women Researchers.

*Prof. Lior Rokach*

Prof. Lior Rokach of the Department of Information Systems Engineering and founder of the Machine Learning Research Laboratory, promotes innovative adaptations of machine learning and data mining methods to create the next generation of intelligent information systems. An active entrepreneur with several patents and technology licenses to his credit, Rokach has worked with several multinational companies, such as Deutsche Telekom, EMC, Intel and General Motors. Rokach has been involved in the creation and development of various novel recommender systems that are deployed in real large-scale e-commerce web-sites serving millions of users. He has made a significant contribution to the field of cyber security by developing machine learning algorithms that are capable of identifying malwares, preventing data leakage, detecting anomalies, and protecting user data and privacy. Rokach is the author of over 100 peer-reviewed papers in leading journals, conference proceedings, patents, and book chapters. He has also authored six handbooks and is the co-editor of three others. He is an awardee of the 2012 BGU Toronto Prize for young researchers.

# Success stories

"Cabarnit" [Computer Systems Protection against Cyber Attacks], an academia - industry program, funded by the Ministry of the Economy and led by BGU, was established in 2011. Six of the eleven participating academia groups are from BGU. The industrial partners include Verint, C4I (of Elbit), Bezeq, and Comtouch.

A privacy solution for Facebook, the Social Privacy Protector (SPP), which can aid parents to adjust their children's profiles with one click, prevent criminals from garnering valuable personal information, and keep teens safe from pedophiles, was developed.

Ongoing research on Android-based mobile devices led to the development of several security mechanisms for the Android platform and identified a critical vulnerability in highly secure Samsung mobile devices that are based on the Knox architecture.

An advanced cyber attack simulator was developed that is able to simulate a variety of cyber attacks within large corporate to medium-sized national networks, thereby enabling evaluation of defense strategies and prediction of attack progress and damage.

Advanced machine learning methods were applied to develop an activity-based verification tool for access control that enables user identity to be verified according to the user's typing patterns.

Research on smartphone security that uses advanced application behavior learned patterns and network anomaly detection methods produced a new technology for malware detection to prevent denial-of-service (DoS) attacks that can shutdown mobile networks.

# Jacob Blaustein Institutes for Desert Research

## Prof. Pedro Berliner, Director

*http://in.bgu.ac.il/en/bidr/Pages/default.aspx*

The Jacob Blaustein Institutes for Desert Research (BIDR) comprise three institutes, the Zuckerberg Institute for Water Research (ZIWR), the French Associates Institute for Agriculture and Biotechnology of Drylands (FAAB), and the Swiss Institute for Dryland Environmental and Energy Research (SIDEER), which includes the Ben-Gurion National Solar Energy Center. The Institutes take an interdisciplinary approach to drylands research, as described below.

# Zuckerberg Institute for Water Research

Prof. Eilon Adar, Director

*http://web2.bgu.ac.il/ziwr/*

## The Institute Today – Water Research for the Benefit of Mankind

BGU's strategic decision to combine its existing scientific capabilities in the water arena into a unified academic institute was realized early in the 2000s, and in 2004 the institute was formally established as the Zuckerberg Institute for Water Research (ZIWR). The mission of the Institute is to carry out interdisciplinary, cutting-edge research in water sciences, aimed at improving human well-being in drylands through technologies and policies for sustainable use of water resources.

Research is conducted in the framework of the Institute's two Departments, as follows. In the Department of Desalination and Water Treatment, research activities are focused on hi-tech desalination and recycling solutions aimed at providing water for drinking, agriculture, and industry. Research is thus conducted on water treatment and desalination processes (reverse osmosis and nanofiltration) and on novel membranes for brackish and seawater desalination and for the treatment of urban and industrial effluents. The Department also operates a state-of-the-art pilot plant for testing, simulating and demonstrating different aspects of processes for the treatment of water and wastewater on a semi-industrial scale.

In the Department of Environmental Hydrology and Microbiology, emphasis is placed on research addressing the quantification and improvement of water quality in arid zones. Research themes thus cover: hydrological and hydro-geological processes, modeling of groundwater flow and transport processes, environmental aspects of water resources, environmental hydro-microbiology, bioremediation of contaminated water, and the impact of climate change on the future availability of water resources. Studies in some of these subjects are conducted in the Department's Artificial Aquifer Laboratory, which is essentially a pilot plant for multidisciplinary investigations of flow and transport processes in streams, soil water and groundwater.

## Ten Years of Transformation

Ten years ago, the ZIWR started as an agglomeration of scientists dealing with the different aspects of water treatment and security. The Institute brought together chemists and chemical engineers studying different aspects of filtration and desalination, environmental microbiologists investigating the microbial processes of dissolved organic compounds in water, hydro-chemists dealing with the chemical evolution of dissolved minerals along hydrological trajectories, and hydro-geologists, engineers and physicists studying flow, transport and bio-chemical evolution processes in soil-water and groundwater reservoirs. Since that time, the ZIWR has acted as a catalyst for integrating all these disciplines. Today, the faculty comprises a solid core of researchers collaborating in various research activities associated with improving water production and water quality. Academic collaboration across research groups and departments is continuing to strengthen, with 19 collaborative research projects involving researchers from the two departments being underway in the current academic year. Thus far, ZIWR faculty have filed 25 patents and 5 have been licensed to industry.

## Research Horizons

Aware that drylands occupy more than one third of the land surface of the Earth, including most of the Middle East and Israel, the ZIWR's vision for the future is firmly fixed on research that will ensure adequate water supplies and water quality to maintain the sustainable development of drylands and the well-being of their growing populations. The ZIWR will continue research toward the production of affordable low-cost water treatment, including novel technologies for the desalination of treated sewage water that utilize impermeable biofouling-protected selective membranes to treat

aggressive effluents. The desalination of treated water is particularly important because the heavy load of dissolved salts in the treated sewage water currently available for irrigation jeopardizes soil quality.

Plans for the future will also focus on the exploitation of alternative energies, i.e., on the development of (i) affordable brackish and seawater desalination processes based on alternative energies, and (ii) new types of membranes, such as ceramic membranes resistant to very aggressive water or hydrophobic membranes that can efficiently transfer pure water vapors under a low heat-temperature gradient, using solar-heated water as the driving force for thermal vacuum vapor desalination. Finally, research on groundwater will center on the containment and even reclamation of contaminated major sub-aquifer units by using advanced operation methods for the management of groundwater reservoirs.

*Prof. Noam Weisbrod*

Prof. Noam Weisbrod, widely known for his extremely popular course on hydrology in rural areas in developing countries that includes practical work in rural villages in Africa, has built a successful career on understanding water and soil contamination by harmful substances. He studies the mechanisms controlling the migration of microscopic substances as they move through different layers of the Earth's surface. These investigations focus on the transport of microscopic substances—namely, colloids and nanoparticles—in natural heterogeneous porous and fractured media and on the colloid-facilitated transport of toxic contaminants in these environments. He also explores groundwater and soil salinization, a dire concern in arid and semi-arid regions throughout the world. In recent years, he has rigorously explored advective fluxes and quantified their effect at the critical Earth-atmosphere interface on the overall flux of greenhouse gases and soil evaporation. The importance of his innovative research is illustrated by the accolades earned by one of his manuscripts – published in Geophysical Research Letters in 2009 – that presented a novel concept of convective fluxes. Not only was this paper highlighted by the editor of Geophysical Research Letters and selected to be that issue's cover article, but it was also acknowledged by Discovery Channel News, Physics Today and Physics World.

Dr. Moshe Herzberg studies bacterial biofilms and biofouling of membranes. The research of the Herzberg lab focuses on five main themes—biofilm formation on membranes in water and wastewater treatment facilities; agents that interfere with biofilm formation; mechanisms by which biofilms affect membrane performance; conditions promoting initial bacterial attachment to membranes; and the inhibition of biofilm growth on surface-modified "anti-biofouling" membranes. Herzberg is the author of 40 scientific publications and has given more than 80 presentations and seminars all over the world. He is involved in interdisciplinary research in collaboration with water scientists and various industries around the globe, including Israel, the Palestinian Authority, Germany, Korea, and the USA. The research is funded by such prestigious foundations as USAID-MERC, ISF, BSF, and BARD and by binational collaborative programs with Germany and Korea. In 2010, Herzberg received the France-Israel Foundation award for academic excellence in water research.

*Dr. Moshe Herzberg*

# French Associates Institute for Agriculture & Biotechnology of Drylands

## Prof. Sammy Boussiba, Director

*http://in.bgu.ac.il/en/bidr/FAAB/Pages/default.aspx*

### The Institute Today - Biotechnological Solutions for Sustainable Dryland Agriculture

Approximately 40% of the Earth's terrestrial surface comprises drylands, which are home to more than 2 billion people. These arid areas, which include such diverse ecosystems as deserts, savannahs and tropical dry forests, are threatened by over-exploitation and desertification. With this global problem in mind, scientists at the French Associates Institute for Agriculture & Biotechnology of Drylands (FAAB) are engaged in cutting-edge research to empower sustainable living in arid areas by developing agrotechnologies and biotechnologies for increasing arid zone food production in areas where traditional or conventional methods of agriculture are difficult – or impossible – to implement.

Research is focused in three main directions, plant biotechnology, aquaculture biosystems, and dryland animal production. Research that falls under the umbrella of plant biotechnology is directed to addressing the increased demand for food by the ever-expanding world population. However, much of the land that has the potential for agriculture is arid or semi-arid, and plants growing in such areas are subject to harsh environmental conditions (such as drought, high salinity, temperature extremes, and high light intensities) that significantly reduce productivity. The problem is compounded by the increasing salinization of soils due to irrigation malpractices, global warming, and desertification. Plant scientists at the FAAB conduct research directed at enhancing crop tolerance to stress, developing methods for sustainable crop production, and finding new agricultural uses for inherently tolerant dryland plants.

The research effort in aquaculture biosystems is focused on two main themes, microalgae and fish farming. R&D on microalgae seeks to maximize the commercial potential of microalgae – the single-cell factories of the future – to produce a variety of biochemicals (such as carotenoids, polyunsaturated fatty acids and algal biofuels) by exploiting the conditions in arid zones—high solar irradiance, high temperatures, and the year-round availability of brackish or seawater. To this end, the Microalgal Biotechnology Laboratory (MBL) of the FAAB advances algal biotechnology at all levels, from characterization of algal strains, through cell physiology and molecular biology, to up-scaling and industrial-scale production of high-value algal products.

Research on fish is also based on the exploitation of arid-zone resources, in this case the large aquifer beneath the Negev desert. Research activities focus on fish biology, nutrition, diseases and behavior and on the development and invention of new and improved aquaculture equipment and techniques, generally with a view to commercial applications, particularly for the small-scale fish farmer.

The above research effort is complemented by that on dryland animal production. For many of the inhabitants of drylands, livestock production is the major form of agriculture, yet it is also one of the main causes of environmental degradation due to factors such as overgrazing and trampling of vegetation. Scientists at the FAAB are developing innovative solutions to allow sustainable dryland animal production that makes efficient use of water resources with minimal impact on the environment.

### Eight Years of Transformation

The mandate given to the FAAB upon its inauguration in 2005 was to gather all the BGU researchers involved in plant sciences into a newly established institute to be part of the Blaustein Institutes for Desert Research on BGU's Sede Boker Campus. The existing core of scientists was then expanded to a critical mass of plant scientists conducting basic and applied research. These scientists exploit complementary advanced techniques in epigenetics, transcriptomics,

metabolomics, molecular biology, physiology and agrotechniques to investigate plant responses to abiotic stresses characteristic of arid environments and to develop new technologies for sustainable plant and animal agriculture.

Concomitant with the recruitment of scientists, there was considerable investment in state-of-the-art infrastructure and equipment. The research excellence of the FAAB is reflected in the success of its scientists in garnering funding from prestigious funding programs, such as the European FP7 Programme, and from commercial companies, such as Syngenta and PTT (the largest biorefinery company in Thailand). In addition, FAAB scientists were invited to join the Technion-Weizmann-BGU I-CORE (Israeli Center for Research Excellence) consortium on renewable liquid fuels funded by the Israel Science Foundation.

## Research Horizons

The FAAB sees the increasingly multidisciplinary nature of plant sciences as pivotal to its future success. The recruitment of exceptional young scientists with backgrounds in holistic systems approaches will act as an anchor around which FAAB scientists will continue to develop dynamic and synergistic research programs at the cutting edge of the life sciences. The integration of the diverse range of biological disciplines within the FAAB will strengthen the already widespread collaborations between its various biologists and between the FAAB and the academic and industrial communities both in Israel and worldwide. Moreover, the FAAB will remain at the forefront in the training the next generation of scientists as it expands its exciting multidisciplinary educational program at the Albert Katz International School for Desert Studies. In addition, FAAB scientists will continue to mentor M.Sc. and Ph.D. research students, and post-doctoral fellows from Israel and abroad.

## International recognition

Prof. Pedro Berliner, Director of the Jacob Blaustein Institutes for Desert Research and FAAB scientist, was awarded the Ordre National du Mérite Agricole (National Order of Agricultural Merit) in 2013. Prof. Sammy Boussiba, FAAB scientist and also head of the MBL, was chosen (2011-2012) as a member of a committee nominated by the US National Academy of Science to assess sustainable production of algal bio-fuels. Currently, Prof. Boussiba serves as Vice President of the International Society of Applied Phycology (ISAP).

*Prof. Sammy Boussiba*

Prof. Sammy Boussiba, Director of the French Associates Institute for Agriculture & Biotechnology of Drylands, joined BGU after two years of postdoctoral studies at Cornell University. Since then, he has been a member of the Microalgal Biotechnology Laboratory (MBL) of the Jacob Blaustein Institutes for Desert Research (BIDR) and has served as the Head of the group since 1995.

Boussiba's current research interests focus on the utilization of microalgae for human health and environmental protection. Among his achievements are the development of a unique biotechnology for the production of astaxanthin-rich algal biomass and the successful expression of BTI toxin genes into nitrogen-fixing

cyanobacteria for combating tropical diseases. As an outcome of this research, two commercial enterprises have been set up—a plant in the Arava for the production of the valuable biochemical astaxanthin from the green alga *Haematococcus pluvialis*, and a start-up company "BioSan" for the commercialization of engineered cyanobacteria for biocontrol of mosquito-borne diseases.

Boussiba has authored or co-authored more than 100 publications and has supervised about 50 research students. In 2003, Boussiba received an honorary doctorate from the University of West Hungary, and in 2004, the Senate of BGU bestowed on him a Chair in Economic Botany in recognition of his achievements in microalgal biotechnology. The above activities have positioned Boussiba among the world's leading scientists in the field of microalgal biotechnology. Between 2008-2011, he served as the President of the International Society of Applied Phycology (ISAP), and, beginning in 2012, he serves as its Vice-President. In 2011, he was nominated as a member of an Ad Hoc Committee appointed by the American National Academy of Sciences to examine "Sustainable Development of Algal Biofuels".


*Prof. Moshe Sagi*

## Prof. Moshe Sagi

studies how plants adapt to environmental stress. His activities are a blend of basic research and applied research aimed at increasing agricultural income in arid zones by adding new crops and developing new agro-techniques. His basic core research centers on sulfite oxidase, aldehyde oxidase and xanthine dehydrogenase enzymes, which contain molybdopterin cofactors. His applied research goal is to develop the halophytes *Salicornia* and *Sarcocornia* as vegetable cash crops for world gourmet markets. At present, Sagi is participating in two prestigious I-CORE projects funded by the Israel Science Foundation (ISF). His research findings have been published in many distinguished peer-reviewed journals and have been cited over 1000 times. In 2008, he was awarded the BGU President's Prize for Outstanding Scientific Achievement.

# From research to industry

The FAAB is committed to promoting academic-industry partnerships to bring the unique discoveries of its researchers to practical and commercial use. FAAB scientists have established a number of collaborative research and development programs with industry in fields such as: developing the biotechnology for production of high-value products for the nutraceutical market; identifying lead genes for improvement of crop tolerance to stress; developing solutions for adopting subsurface drip irrigation; and investigating the effect of growth regulators on crop growth and yield.

# The Swiss Institute for Dryland Environmental and Energy Research

Prof. Boris Zaltzman, Director

*http://in.bgu.ac.il/en/bidr/SIDEER/Pages/default.aspx*

## The Institute Today – Linking Exact, Life, and Social Sciences for Studying the Desert

Set up conceptually in 2007 and formally established in 2013, the Swiss Institute for Dryland Environmental and Energy Research (SIDEER), the youngest member of the Jacob Blaustein Institutes for Desert Research, is based on a bold vision—to develop a sound scientific approach to the synthetic study of arid environments and of the people who inhabit them. SIDEER was thus established as the first-ever institute bringing together architects, anthropologists, sociologists, ecologists, physicists, and applied mathematicians united under a single roof by a common mission to produce fundamental information related to physical and living desert environments and their interaction. The fulfillment of this mission and the creation of SIDEER cement the structure of Blaustein Institutes by complementing the applied and specialized studies of the other two Institutes with fundamental multidisciplinary research. The basic knowledge generated by the research conducted under the SIDEER umbrella helps to guide people and governments addressing the world-wide threat of desertification and striving for sustainable development and preservation and conservation of the environment. The three SIDEER departments reflect its multidisciplinary approach, tying together research conducted in the exact, life, and social sciences.

The research conducted at the Marco and Louise Mitrani Department of Desert Ecology is underpinned by two main goals—to study the desert (primarily the Negev Desert) as a model ecosystem and to ensure that departmental experience and expertise are ultimately used for conservation and prudent, sustainable development of desert habitats. To this end, the Department has worked with scientists from Turkey, Jordan, Egypt, and the Palestinian Authority.

The Alexandre Yersin Department of Solar Energy and Environmental Physics is staffed by scientists applying fluid mechanics to atmospheric research and water desalination and studying such diverse subjects as: ecological dynamic systems and pattern formation; dust and sand dune dynamics; photovoltaics and highly concentrated solar radiation; river network formation; stochastic processes in the atmospheric and climate dynamics; micro-algal biotechnology; resource economics; and remote sensing. The desert with its unique conditions – harsh climate, intensive sunlight, sand storms, a shortage of fresh water but an abundance of saline water, and rich plant and animal population patterns – provides a boundless playground for these studies. The Department also encompasses the Ben-Gurion National Solar Energy Center, which is described below.

The Bona Terra Department of Man in the Desert brings together social scientists, architects, and urban planners into an integrated academic framework. The Desert Architecture and Urban Planning Unit addresses the issue of building in the desert and the specific problems of desert habitation, which stem both from natural conditions, such as resource availability and climate, and from human issues that take on special significance in an arid environment—thermal comfort, energy consumption, construction technology, urban form and regional development. Research topics in the Social Studies Unit include anthropology, sociology, regional development, human geography, and economic history of peoples in drylands. Interdisciplinary investigations include resource and proactive contingency planning and crisis management. Special attention is given to processes of urban and rural settlement of the Bedouin community.

## The First Year and Research Horizons

In May 2013, the Institute was set up with the mandate to establish an excellent multidisciplinary institution aimed at the synthetic study of the arid environment. During the first year, the 35 SIDEER members published more than 80 papers

in top-ranking peer-reviewed journals, including Nature, and successfully collaborated with world-leading research groups in the framework of highly competitive research grants, e.g., the US-Israel Binational Science Foundation (BSF), the Binational Agricultural Research & Development Fund (BARD), the German-Israel Foundation (GIF), The EU Seventh Framework Programme (FP7) and the Israel Science Foundation (ISF). The major aim and challenge for SIDEER in the immediate future is to overcome the "generation shift" due to the retirement of a large part of its members and to strengthen itself through recruiting excellent scientists. During the first year, four new faculty members were recruited.

In the longer term, SIDEER's vision is based on the concept that excellence in multidisciplinary studies means balanced development of both theoretical and experimental research. SIDEER's current facilities are better suited to theoretical research, while experimental studies have been somewhat hampered by a shortage of manpower and funding. To address this problem, the BGU administration has made a strategic decision to develop the field of solar energy, creating two new positions for excellent scholars and several positions for technicians. This decision will radically improve SIDEER's status in experimental solar energy research. To complement this strengthening of experimental solar-energy research and to enhance experimental research in other areas, SIDEER intends to set up six new laboratories: Geospatial and Architectural Imaging and Analysis; Ecological and Evolutionary Parasitology; Conservation and Management; Experimental Climate Change; Photovoltaic and Charge Transfer, and Solar Optics. The establishment of these new laboratories will complete the process of reorganizing SIDEER and will add a new dimension to the research performed at the Institute.


*Prof. Hendrik Bruins*

## Prof. Hendrik Bruins

joined BGU in 1982. Bruins has published numerous papers, including one in Nature and three in Science. He has also authored two books and edited three collective volumes. In 2006, the Dutch Royal Award of Officer in the Order of Orange-Nassau was bestowed on Bruins for achievements in policy-oriented studies on drought, hazard assessment and contingency planning in drylands, geo-archaeological desert research and innovative chronological studies on the ancient Near East.


*Prof. Boris Krasnov*

## Prof. Boris Krasnov

studies various aspects of ecology and evolution of host-parasite interactions by combining experimental work on physiological questions, field work on ecological questions, and comparative or meta-analyses on biogeographical or evolutionary questions. His main research model constitutes parasitic fleas on small mammals, but he also studies other groups of ectoparasitic arthropods, such as ticks and mites. His research also deals with vector-borne emerging and re-emerging diseases such as bartonellosis and the plague. Krasnov's research is funded by grants from competitive funding agencies, such as ISF and BSF. He has published numerous papers and has authored three books. In 2010, he received the Minister of Immigrant Absorption's Prize for Outstanding Scientists for his ground-breaking ecological research.

# Ben-Gurion National Solar Energy Center

## Prof. Daniel Feuermann, Director

*http://in.bgu.ac.il/en/solar/Pages/default.aspx*

### The Center Today – Israel's Renowned Solar Energy Center

The researchers – physicists, chemists and engineers – and support staff of the Center, located on BGU's Sede Boqer Campus, are members of the Alexandre Yersin Department of Solar Energy and Environmental Physics of the SIDEER. The Center's mission is to advance basic and applied research in the field of solar energy conversion and to assist Israel's science-based industry in developing practical and economical devices in this field. Its unique location, in the center of the Negev arid zone, with its dry climate and clear skies, large experimental areas and uncluttered horizons, makes the Center an ideal place for both large- and small-scale experimental projects. It therefore enjoys a steady demand for in-situ measurements of solar products from companies around the world. Equally important is the possibility of bringing direct sunlight via heliostats into the lab in a precise manner, a feature – unique in Israel and rarely found elsewhere in the world – that permits in-depth studies of physical phenomena of photovoltaic devices and the study of material properties of sun-exposed materials under controlled indoor conditions. This capability has led to a large number of collaborations with universities in Israel and abroad, such as the cooperative projects on: multi-junction cells with the Fraunhoffer Institute in Germany, the testing of organic photovoltaics with the RISØ National Laboratory, Denmark, and the development of novel nanomaterials with the University of Western Australia, to mention but a few.

## Ten Years of Transformation

The Solar Energy Center had its origins in 1985 when the Israel government decided to establish a test field for companies to build pilot plants for the conversion of solar energy to electricity and to evaluate their performance. Several years later, the Center was formally transferred to the BIDR. Since then, the Center has served as a research laboratory for innovation in solar-energy-related science and has provided the research infrastructure for faculty and students alike.

Research over the past ten years has focused on the development of novel optics for concentrating sunlight, on the physics of dust and its removal from surfaces via electrostatic forces, on understanding the physics of multi-junction solar cells, and on the development of organic photovoltaic cells whose main ingredient is carbon (basically plastic with some additives). Such photovoltaic cells are potentially very cheap (they can be produced by printing processes), but they suffer from low efficiency and short life times. Both these shortcomings have thus been areas of intense research. The output from the Center's research, aside from the large number of scientific papers in premier journals, can be found in many patents, some jointly submitted with industry, and in solar energy collectors operating at the level of many megawatts in numerous places all over the world.

At the time of writing, the infrastructure of the Center is in the process of being upgraded, with the addition of new laboratories and an office building, funded in part by the French Friends of Ben-Gurion University. The new laboratories include a clean room and chemical and optical laboratories, all of which will facilitate more varied research directions.

## Vision for the Future

The realm of solar energy research has been changing over the last decade or two from engineering analyses and measurements (solar resource availability data and statistics) to research and development of more efficient devices and novel materials for the conversion of solar energy, primarily into electricity. It is believed that the new infrastructure soon to be at the disposal of the researchers will accelerate this shift to what is essentially materials research. In addition, and more importantly, the new researchers joining the Center will expand its research scope. Applied and basic scientific research will continue in parallel to advanced research in the field of sustainable solar energy.

*Prof. Eugene Katz*

Prof. Eugene Katz, a member of the Ben-Gurion National Solar Energy Center and of the Ilse Katz Institute for Nanoscale Science and Technology, conducts research on organic photovoltaics (OPV), with emphasis on the development of low-cost solar cells. He and his research team are among the world leaders in photovoltaic characterization and have been invited to participate in a number of inter-laboratory tests comparing the efficiency and operational stability of OPV.

Katz is currently a member of two research consortia funded by the EU PF7 Programme. The LARGECELLS consortium focuses on the development of organic photovoltaic cells based on conjugated polymer materials and polymer-inorganic hybrid systems and their application in large-area stable devices fabricated using printing techniques. The NANO_GUARD group investigates fullerene-based systems for oxidative inactivation of airborne-pathogens. Katz is also an awardee, together with Prof. Rachel Yerushalmi Rozen of the Department of Chemical Engineering, of the prestigious F.I.R.S.T. grant from the Israel Science Foundation (ISF). He has published a number of papers on innovative photovoltaic technologies in such journals as Applied Physics Letters, Advanced Energy Materials, and Energy and Environmental Science.

*Prof. David Faiman*

Prof. David Faiman was the first scientific director of the Ben-Gurion National Solar Energy Center, serving in that capacity from 1993 until his retirement in 2012. It was under his leadership that what had originally been conceived merely as a demonstration and testing facility became a globally recognized institute in solar research. In November 2012, Faiman was recognized for his visionary work in the field when he received a Lifetime Achievement Award from the Eilat-Eilot International Renewable Energy Conference, the leading clean-tech event in Israel. Faiman was a pioneer in the field of concentrator photovoltaics (CPV). This technique takes the abundant desert solar radiation, concentrates it using mirrors or lenses up to a thousand times or more, and focuses it onto high efficiency solar cells. The spin-off from this research has been commercialized as the Zenith system, which generates electricity and hot water. Faiman's work was greatly facilitated by the nearly perfect solar spectrum at Sede Boqer, which allows the development of uniquely accurate outdoor measurement techniques for characterizing and quantifying the degradation rates of various kinds of photovoltaic modules. One of his recent contributions to the field was the development of a technique for assessing the operating temperature of photovoltaic modules without the need to measure it. The technique has been proposed for inclusion in one of the standards of the International Electrotechnical Commission. Faiman now focuses his research effort on electricity storage and its potential role in facilitating the massive penetration of solar-generated electricity into national grid systems. He continues to be Israel's representative on the Task 8 Photovoltaic Specialist Working Group of the International Energy Agency: Very Large Scale Photovoltaic Plants in the Desert.

Dr. Sarab Abu-Rabia-Queder, member of the Bona Terra Department of Man in the Desert and incumbent of the D.E. Koshland Jr. Family Career Development Chair in Desert Studies, conducts research on the sociology of gender and education in the Arab-Bedouin population in Israel. She has published one book, co-authored two others, and co-edited one collective volume. Her studies were among the first to examine various intersecting power structures that shape Bedouin women's production of negotiating strategies. Abu-Rabia-Queder's research is funded by grants from competitive funding agencies, such as the Israel Ministry of Science, Technology and Space and the Rothschild Caesarea Foundation. She is the recipient of several awards and citations, including two from BGU – the Rich Foundation Award for the Advancement of Women in Academy (2009) and the Toronto Prize for Excellence in Research for young scholars (2013) – and the MAOF academic scholarship for Arab doctors.

# The National Institute for Biotechnology in the Negev

Prof. Varda Shoshan-Barmatz, Director

*http://cmsprod.bgu.ac.il/Eng/Centers/nibn*

## The NIBN Today – A World-Class Research Center in Biotechnology

As the first self-organized, independent research body to be established in Israel, the National Institute for Biotechnology in the Negev (NIBN) functions under the auspices of BGU as a self-contained institute, whose mission is threefold: bridging the gap between basic and applied research, serving as a link between applied science and industry and establishing the scientific infrastructure for a biotechnology industry in the Negev.

The NIBN operates through multidisciplinary channels of communication and collaboration, relatively free of departmental concerns but subject to ongoing evaluation of the appropriateness of its research programs and the performance of its scientists. The strength of the NIBN derives from a combination of outstanding scientists whose research has biotechnological implications, state-of-the-art laboratories and service units, and close cooperation with BGU faculties, departments and research centers working in tangential or overlapping fields.

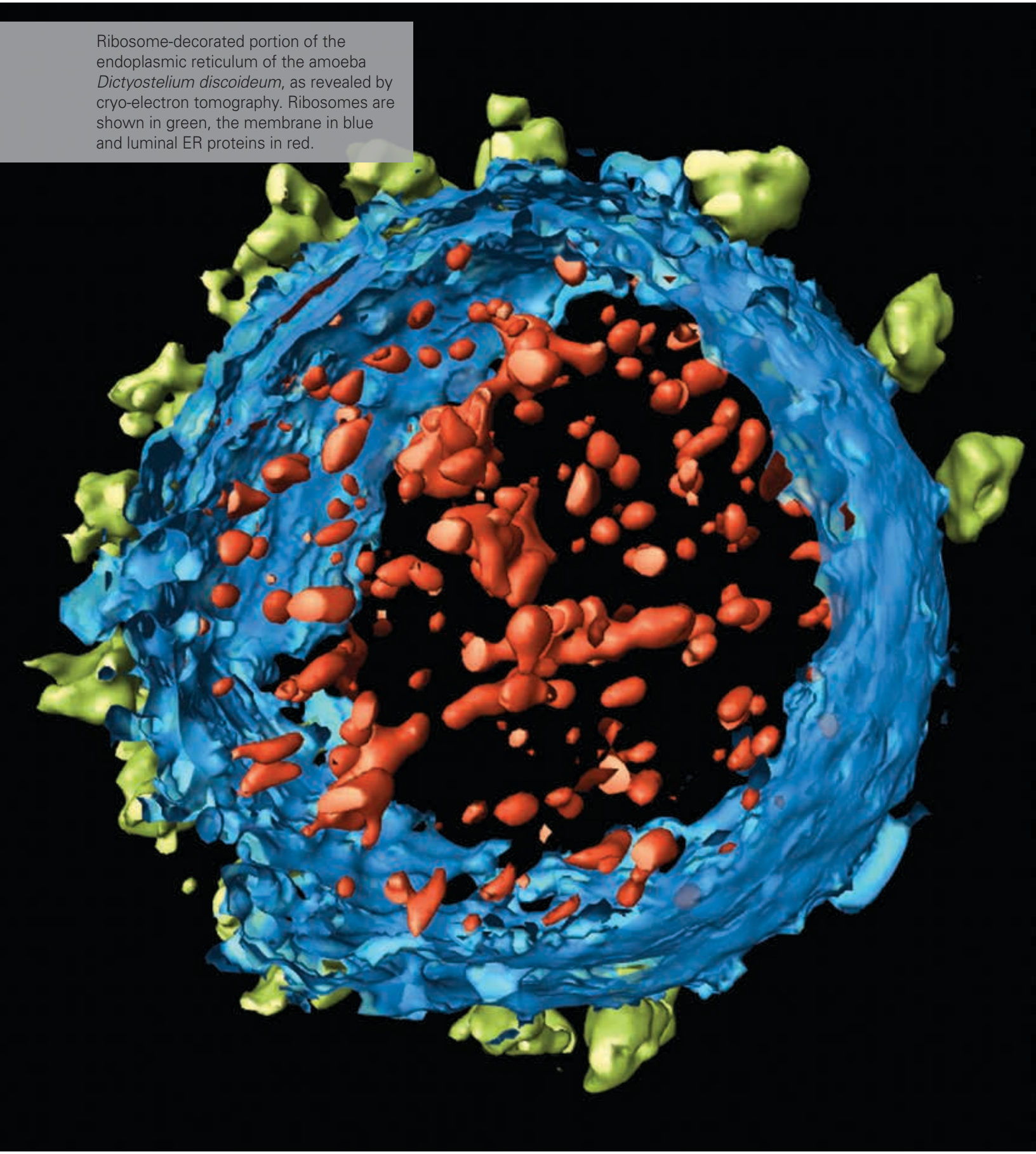
The fields of research at the NIBN are concentrated into five main categories: cancer research, vaccines and virology, bacterial infectious diseases, genetic disorders, and other applied biotechnological fields, such as nanoparticles, biomineralization and imaging. Within this overall framework, the current focus of applied research is directed to novel approaches for cancer therapy, vaccines for Alzheimer's disease, and the development of innovative antibiotics. Emphasis is also placed on human genetic diseases, biomarkers and magnetic particles for drug-delivery systems and diagnostics.

## From Idea to Institute

The idea to set up the NIBN was proposed in 2001. The first step towards its establishment was taken in 2005, with the signing of a trilateral agreement between the Israel Government, BGU, and a private donor, Mr. Edgar de Picciotto of Switzerland, as part of a national master plan targeted to develop the Negev. In November 2009, the NIBN was incorporated as a company with an eight-year development plan having a budget of $90M. The Institute's activities are steered by an international Scientific Advisory Board, which, over the years, has included the Nobel Prize Laureates Prof. Sir Aaron Klug, Prof. Ada Yonath and Prof. Aaron Ciechanover, together with the distinguished international scientists Prof. Raymond Dwek, who is also a special advisor to the President, Prof. Philip Needleman and Prof. Richard Ulevitch. Recently, Prof. Hermona Soreq and Prof. Nathan Nelson were recruited to the Board.

The high quality of the research performed at the NIBN is reflected in the impressive number of grants – totaling about $10M in the past three years – received by NIBN members from international and national funding sources, including such prominent funding programs as the European Research Council (ERC) and the Leukemia and Lymphoma Society. Furthermore, NIBN scientists have filed more than a dozen patents in the same period.

In the coming year, the Institute will expand into an additional new state-of-the-art building, which will house laboratories, offices and the Institute's Core Service Units – Genetics, Bioinformatics, Protein Crystallization, Microscopy, and Cytometry & Proteomics – that provide services to academic institutions and companies throughout Israel. These units are equipped with the most advanced equipment, some of which is unique in Israel. In addition, the new building will include several laboratories for the use of both start-up and established biotech companies.



Ribosome-decorated portion of the endoplasmic reticulum of the amoeba *Dictyostelium discoideum*, as revealed by cryo-electron tomography. Ribosomes are shown in green, the membrane in blue and luminal ER proteins in red.

## Research Horizons

The continued success of the NIBN model rests on three factors — excellence, multi-disciplinary collaboration, and appropriate resources, all of which were carefully addressed in the NIBN's development plan and are evaluated on an ongoing basis by the Scientific Advisory Board.

**Excellence** – The NIBN will continue to attract outstanding young scientists returning from advanced training abroad by offering research opportunities and challenges.

**Multi-disciplinary collaboration** – The NIBN management team (Director, Deputy Director, and Director of Applied Biotechnology) work in concert to provide the physical and intellectual environment needed to bring about the synergy that can be generated by the collaboration of scientists from different disciplines and to promote interactions with industry. To maximize the NIBN's commercialization potential, the Institute will provide grants for selected interdisciplinary projects.

**Resources** – The NIBN will continue to use its own sources of funding to purchase frontline equipment and to support applicative research, leading to the generation of intellectual property.The new building will provide suitable space for a critical mass of multidisciplinary researchers. A successful NIBN will ultimately generate much of its own funding, although a substantial endowment will be needed to create the leverage for commercial enterprises.

# Success stories

## from the lab to the biotech industry

- A protein (superior sIL-17R) for the treatment of inflammatory disorders, such as psoriasis, rheumatoid arthritis, lupus, Crohn's disease, colitis, and asthma is currently under development. Positive proof-of-concept data has already been demonstrated in a model of psoriasis.
- A new start-up company, ViDAC Pharma, Ltd., has been established to further develop VDAC1-based anti-cancer therapy.
- A huge prawn aquaculture project has been established by Tiran Shipping, Ltd., based on a technology of fresh water prawn sex modifications.

The synergy derived from the above three factors allows the NIBN, as a biotechnology institute, to fulfill its mission to bridge the gap between basic and applied research and to stimulate the interest of the commercial community in NIBN's activities. The Institute is thus contributing to realizing David Ben-Gurion's dream: "We seek to build a scientific research and teaching center that will be a source of moral inspiration and courage, rousing people to a sense of mission, noble, creative and fruitful."

## International Recognition

Prof. Amir Sagi, who serves as President of the International Society for Invertebrate Production and Development (ISIRD), was invited to visit Myanmar shortly after its opening to the Western world as a first step to towards promoting collaboration in aquaculture research between the two countries. Prof. Sagi is also the 2013 winner of the Novus Global Aquaculture Innovation Award for a biotechnology application to produce all-male populations of the giant freshwater prawn. In March 2012, Prof. Ohad Birk was invited to appear on the Doha Debates (transmitted to more than 400 million homes globally) as a participant in a discussion of cousin marriages in the Arab world.

Prof. Varda Shoshan-Barmatz has been involved in the establishment of the NIBN since its inception and from 2006 has served as its Director. As such, she has made numerous significant contributions in the scientific and technological arena both in her own research field and through her role as Director of the NIBN.

Shoshan-Barmatz is Professor of Molecular Physiology in the Department of Life Sciences and the incumbent of the Hyman Kreitman Chair in Bioenergetics. She focuses on studying the structure-function relations of membranal proteins while conducting multi-disciplinary research from the level of purified proteins through organelles to intact cells and, more recently, to animal models. Her current research focuses on programmed cell death (apoptosis) mediated by the energy generators of the cell – the mitochondria. The goal of this research is to understand the molecular components of the mitochondrial apoptotic machinery so as to minimize the self-defense mechanisms of cancer cells and to stimulate their death as a means of developing anti-cancer therapies. Her crucial

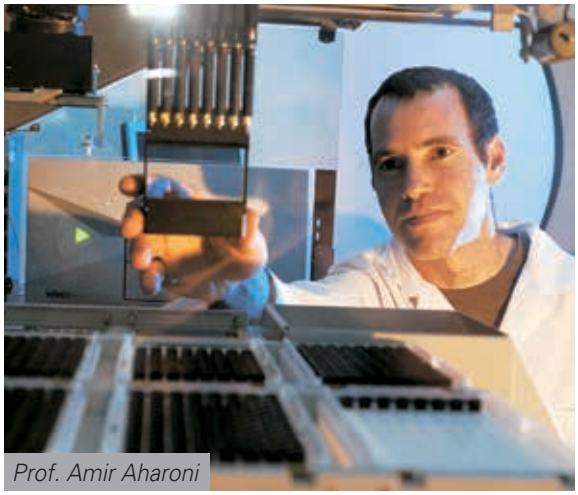
*Prof. Varda Shoshan-Barmatz*

fundamental discoveries have not only contributed to a better understanding of the structure-function of the mitochondrial protein voltage-dependent anion channel (VDAC) but have also shifted paradigms. On the basis of her research findings, Shoshan-Barmatz has developed novel VDAC1-based strategies for cancer therapies. Moreover, she has converted these findings into translational research that form the basis of a new company, ViDAC Pharma, Ltd., established about two years ago.

Shoshan-Barmatz has supervised over 53 M.Sc. and Ph.D. students, some of whom now hold academic positions in Israel or abroad. Also of note are her efforts to encourage women to enter graduate studies, and, indeed, she has supervised 18 of them.

Prizes awarded to Shoshan-Barmatz include the Hestrin Prize from the Israel Biochemistry Society and the Teva Pharmaceutical Industries Ltd Research Award for her work on neuromuscular communication. She was nominated for the Excellent Scientist award from the city of Beer Sheva and selected by Lady Globes Journal as one of the 50 most influential women in Israel in 2009.

Prof. Amir Aharoni, a member of the Department of Life Sciences and the NIBN, develops and applies novel methodologies based on directed evolution and biochemical and genetic approaches to study the function of proteins both for basic and for applied research. Using protein engineering methodologies, his group has developed a superior protein that can block pro-inflammatory signals and inhibit the formation psoriasis plaque. This work has formed the basis for developing, in collaboration with Teva Pharmaceutical Industries Ltd., a promising drug candidate to treat psoriasis (see box).



*Prof. Amir Aharoni*

Aharoni is the author of numerous scientific articles that have appeared in top-tier journals and is the recipient of three European Union FP7 grants – the prestigious ERC Starting Grant, an International Training Network (ITN) grant, and a Proof of Concept (PoC) grant. He has also received grants from competitive funding agencies, such as the German-Israeli Project Cooperation (DIP) and the Israel Science Foundation (ISF).

Prof. Ohad Birk of the Shraga Segal Department of Microbiology, Immunology and Genetics conducts ground-breaking genetic research through the Naomi Bartnoff Fisher Genetic Counseling Unit and the Morris Kahn Laboratory of Human Genetics of the NIBN, which he heads. His research has led to the discovery of some 20 genetic diseases in Arabs and Jews, providing insight into the nature of illness and unraveling molecular pathways of normal human development. His translational approach has led

*Prof. Ohad Birk*

to dozens of routine massive genetic carrier tests and to the prevention and practical eradication of numerous severe neurological disorders common in Arabs and in Sephardic Jews. This prevention program has reduced the infant mortality rate in the Negev Bedouin community by 30 percent over the past five years. Among his findings are the first gene for severe short-sightedness and a gene associated with psoriasis.

While Birk's work has both scientific and social impact, it also demonstrates effective Jewish-Arab coexistence, as echoed repeatedly in the press, from a 2006 cover story in the NY Times science section to a recent interview in Al Jazeera and participation in the BBC's prestigious "Doha Debates" discussion program, filmed in Qatar.

Prof. Lital Alfonta, incumbent of the Elaine S. and Alvin W. Wene Career Development Chair in Biotechnology Engineering, is a member of the Avram and Stella Goldstein-Goren Department of Biotechnology Engineering, the Ilse Katz Institute for Nanoscale Science and Technology, and the Edmond J. Safra Center for the Design and Engineering of Functional Biopolymers, and an associate member of the NIBN. She heads a multidisciplinary laboratory that focuses on two main areas of interest—genetically engineered microbial fuel cells and the use of unnatural amino acids to engineer proteins with novel functionalities. Alfonta's team was the first in the world to demonstrate a site-specific modification on the surface of bacteria for direct electron

*Prof. Lital Alfonta and Prof. Michael Meijler – partners at home and in the lab*

transfer communication with inorganic materials, a finding that has engendered significant interest from a number of commercial companies.

Alfonta is an ERC Starting Grant awardee. She has published 45 scientific articles and 7 patents. Two of her recent publications were named by Faculty of 1000 Prime as groundbreaking research. Her awards include the Kaye Innovation Award from The Hebrew University of Jerusalem and the Marc Rich Foundation Prize for Women Researchers.

Prof. Michael Meijler is a member of the Department of Chemistry, the NIBN, and the Edmond J. Safra Center for the Design and Engineering of Functional Biopolymers in the Negev. His work is aimed at understanding the fundamental questions that govern the role played by small molecules in communication between bacteria. By understanding how bacteria react with one another and even with higher organisms, such as ourselves, he aims to develop new ways to fight disease caused by certain bacteria, on the one hand, or to protect and enhance the growth of beneficial bacteria, on the other hand.

Meijler has an impressive research record for which he has received two BGU awards—the Dean's Award for Excellence in Research and the Toronto Prize for Excellence in Research. He has also been awarded several prestigious research grants, such as the Human Frontiers Science Program Young Investigator Grant (2007) and the ERC Starting Grant (2009), in addition to many other research grants. He has 57 scientific publications to his credit, many in highly regarded peer-reviewed journals.

# Zlotowski Center for Neuroscience

## Prof. Alon Friedman, Chair

*http://in.bgu.ac.il/en/zlotowski/Pages/default.aspx*

### The Center Today - a Leader in Brain Sciences

Understanding the human brain is one of the greatest challenges facing mankind. Meeting this challenge requires a strong collaborative effort by researchers from a wide range of fields. The Zlotowski Center for Neuroscience does just that—it brings together 54 researchers and over 130 graduate students from BGU's Faculties of Engineering, Natural and Health Sciences, and Humanities and Social Sciences. The Center's mission is to promote fruitful multidisciplinary collaboration between these researchers by providing the required infrastructure for research and the interface for the meeting of the different research fields, including neurobiology, electrophysiology, system physiology (e.g., motor control), vision, psychology, linguistics, and philosophy. The Center also provides the framework for collaboration between clinicians and researchers studying neurological diseases (including stroke, epilepsy, autism spectrum disorder, and Alzheimer's disease). The infrastructure includes multi-user cutting-edge facilities for imaging the brains of people and animals, which enables the researchers of the Center to directly study complex molecular, physiological, cognitive and behavioral functions in health and disease. Much of the infrastructure is housed on the campus of the Soroka University Medical Center, which is situated in close proximity to BGU's main campus. Within the framework of the research activities of the Center's members, strong emphasis is placed on the education of a new generation of neuroscientists through unique multi-disciplinary neuroscience teaching programs at the graduate and undergraduate levels. The recently established School for Brain Sciences at BGU with its Department of Cognitive and Brain Sciences has already attracted over 180 outstanding undergraduate students and 30 graduate students. Researchers of the Zlotowski Center provide high-level teaching and individual guidance to students from all faculties and disciplines.

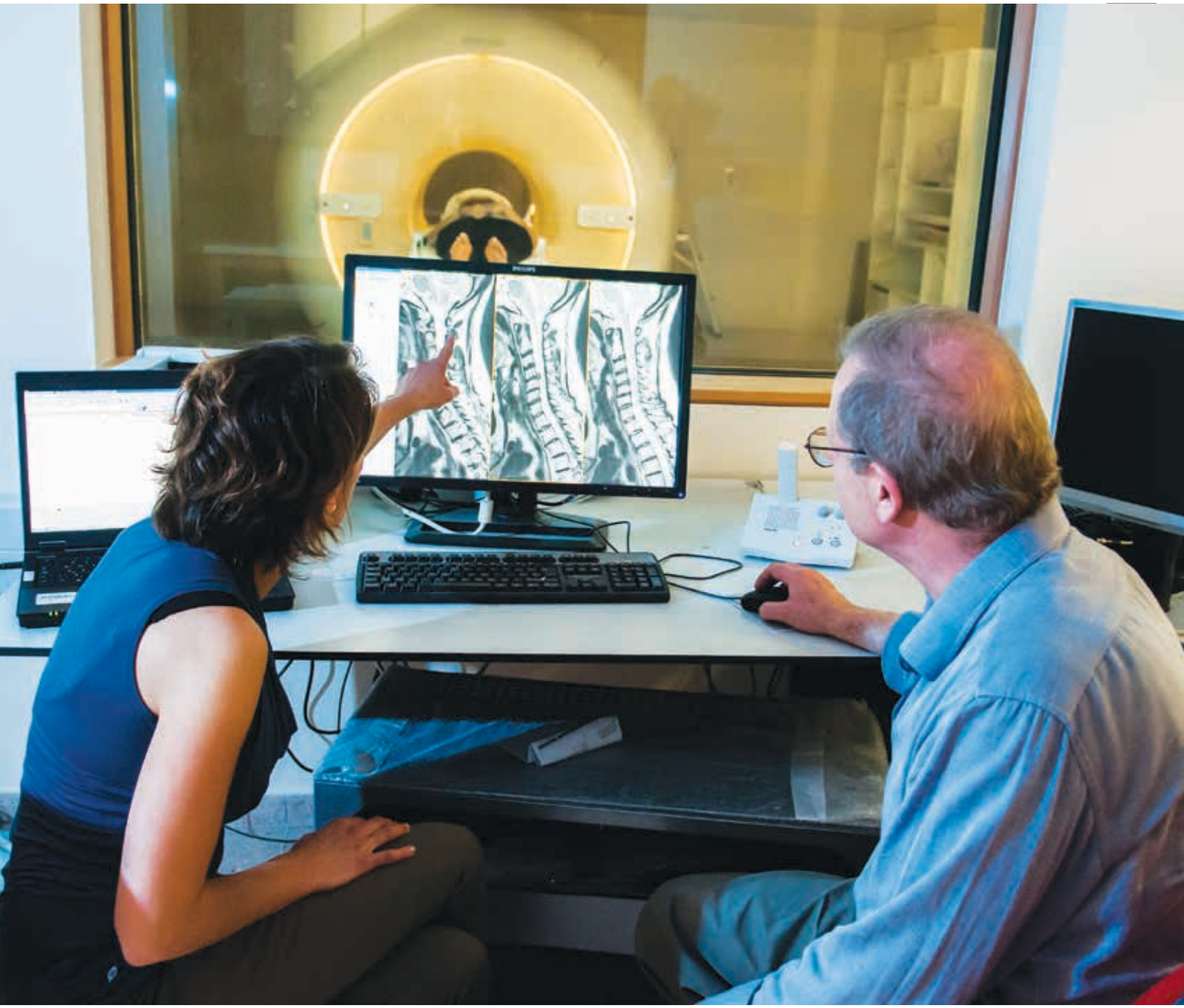
### Ten Years of Transformation

During the last ten years, BGU's neuroscience community has increased significantly, and as a result fields of research in which BGU has traditionally excelled have been consolidated and complemented by research areas that are new to BGU—the molecular basis of brain diseases and computational neuroscience. In parallel, advanced research in human imaging has been promoted by the recruitment of young scientists and the establishment of the Brain Imaging Research Center (BIRC). The BIRC integrates several sophisticated technologies for advanced brain research, with the new equipment including magnetic resonance imaging (MRI) facilities for anatomical and functional studies of the human brain (a 3T advanced magnet was installed in April 2012), a micro MRI for animal studies, electro-encephalography for human research, and video-aided neurophysiological equipment for the recording of brain activity from behaving rodents.

### Research Horizons

"So there's this enormous mystery waiting to be unlocked, and the BRAIN Initiative will change that by giving scientists the tools they need to get a dynamic picture of the brain in action, and better understand how we think and how we learn and how we remember. And that knowledge could be - will be - transformative. " Barak Obama (2013)

Brain research has become a major priority the world over. One of the major reasons is the large burden of brain diseases in Western countries and the prediction that with increasing life expectancy, neurological and mental disorders, including depression, stroke, Parkinson's, Alzheimer's and epilepsy, will become (and already are) the most common cause for disability. Several pediatric neurological disorders, including autism and epilepsy, are similarly showing an increase in prevalence. At present, all these neurological diseases have no cure, and prevention strategies hardly exist. Zlotowski Center researchers – like



their counterparts the world over – are thus facing an enormous challenge to better understand the underlying mechanisms of brain diseases and to discover new strategies for the prevention and treatment of these diseases. To address this challenge, the Center's strategic plan derives from the recognition that only multidisciplinary research involving basic researchers and clinicians is likely to result in clinically relevant, applicable, and rapidly translational results. This recognition has led the Center to focus on establishing groups of clinicians of the Soroka University Medical Center working together with basic scientists of the Center with the aim to develop novel approaches towards better understanding and treating patients with brain diseases. In the future, research groups will continue with the current thrust of the research that is directed to studying diseases of motor control, ischemic and traumatic brain injuries, and stress-related brain disorders.


*Prof. Alon Friedman*

Prof. Alon Friedman, medical doctor and neuroscientist, has served as the elected chair of the Zlotowski Center for Neuroscience since 2011. He is a member of the Department of Physiology and Neurobiology and is at present active in setting up the new School for Brain Sciences and the Department of Brain and Cognitive Sciences. He also heads the Laboratory for Experimental Neurology and Neurosurgery, part of BGU's Brain Imaging Research Center. His research focuses on the pathophysiology of brain disorders and the effects of stress on the nervous system. His team conducts multidisciplinary research on novel therapies for the prevention and treatment of brain diseases, specifically injury-related epilepsy and neurodegeneration. His most important contribution to the field lies in the ground-breaking research of his team on the role of the blood-brain barrier in the onset of epilepsy following brain injuries.

Friedman has authored and co-authored numerous scientific publications, including books, collective volumes, and articles in leading scientific journals. For his discovery on the roles of brain blood vessels and the blood-brain barrier in the pathogenesis of epilepsy, he won the prestigious international Michael-Prize for epilepsy research (2007). His awards also include a Mercator Professorship (Charité Medical University, Berlin), the Foulkes Foundation Research Award, the Teva Research Prize for Young Investigators, the Ziegler Prize, the APS Kass Award for Medical Research, and the American Physicians Fellowship for Medicine in Israel. Friedman's research is funded by a number of competitive funding agencies, including the EU FP7 Programme, the Israel Science Foundation (ISF), the German Research Foundation (DFG), the German-Israeli Foundation (GIF), the National Institutes of Health (NIH), and the United States-Israel Binational Science Foundation (BSF).

Prof. Golan Shahar is Professor of Clinical-Health Psychology at BGU and Visiting Professor of Psychiatry at Yale University School of Medicine. At BGU, he is the founding director of the Stress, Self, and Health (STREALTH) Lab and of the Center for the Advancement of Research on Stress and Related Disorders (BGU-CARES). In recent years, he has received a number of awards and competitive research grants that enabled the foundation of STREALTH. Shahar's expertise lies in translational stress research and integrative psychotherapy. His novel focus on stress has led to important investigations on the role of psychological risk and resilience, on psychopathology of young adults, and on sufferers of chronic pain. Shahar is also recognized as a leader and innovator in the field of psychotherapy integration, publishing clinical artifices that include guidelines for the integration of interventions from various psychotherapy schools. His research has been published in over 130 articles in top journals in psychology, psychiatry, pediatric medicine and pain medicine. He is now completing a first-author book, "Erosion, Self-Made: The Psychopathology of Self-Criticism" (Oxford University Press). He serves as Chief Editor of the Journal of Psychotherapy Integration (JPI).


*Prof. Golan Shahar*

# Prof. Avishai Henik, a world renowned scientist in numerical cognition

Prof. Avishai Henik of the Department of Psychology is one of the founders of the Zlotowski Center for Neuroscience and former Dean of the Faculty of Humanities and Social Sciences. He studies numerical processing, attention, word processing, and synesthesia with the aim to elucidate the basic mental operations and brain structures involved in these processes.

In 2008, the Israel Science Foundation (ISF) recognized the importance of Henik's work and endowed him and his colleagues (Professors Tzelgov and Berger from BGU and Dr. Rubinsten from the University of Haifa) with funding for a prestigious Center of Excellence for the study of numerical cognition. Funding was recently renewed for four more years.

In 2012, Henik won the esteemed European Research Council (ERC) Advanced Research Grant for research on the abilities and deficiencies involved in numerical cognition. The research study, "Size Matters in Numerical Cognition," examines the development of human numerical ability and the underlying brain system involved in this ability. The study aims to investigate the possibility that a system designed for the perception and evaluation of sizes and amounts is fundamental (i.e., a core system) to the development of basic numerical skills.
In the area of attention, Henik examines both selective attention and visual-spatial orienting of attention. In addition to studies of humans, Henik also examines the evolution of attention by conducting studies on the archer fish (the latter research being conducted in collaboration with Prof. Ronen Segev of BGU's Department of Life Sciences).

In the past ten years Henik has received several awards, among them the BGU President's Award for Excellence in Research and a BGU distinguished professorship. He was also elected a fellow of the American Psychological Society. Throughout the years, Henik has supervised an impressive number of graduate students, several of whom have gone on to successful academic careers.

# The Edmond J. Safra Center
## for the Design and Engineering of Functional Biopolymers in the Negev
Prof. Gonen Ashkenasy, Head

### Mission
The Center was established in 2008 to serve as an umbrella bringing together scientists from a variety of disciplines in the natural sciences and engineering to conduct research on multi-level design, preparation and characterization of biopolymers with novel functionality. The rationale for setting-up such a Center was the belief that collaborative research efforts of different researchers would both contribute to a deeper understanding of complex biological systems and lead to the development of significant electronics devices, medicines, diagnostics, and chemical applications.

### Activities
Within its mandate to explore the potential of using native, modified, and man-made biopolymers as nano-dimensional entities, the Center's activities focus on three main topics – all at the forefront of science and technology – conducted partially as collaborative research in the Center's laboratories:

- Biopolymers for energy conversion applications,
- Multivalent interference with bacterial communication for biomedical applications,
- Total synthesis of proteins as novel therapeutics.

Since the establishment of the Edmond J. Safra Center, its globally recognized members have published over 100 scientific publications in top international journals in chemistry, physics, biology and nanotechnology. The research groups have garnered funding of several millions of dollars from prestigious competitive research grants, including the EU's ERC program, HSFP, DIP, GIF, BSF, and ISF.

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Prof. Ashraf Brik, a member of the Department of Chemistry and the Edmond J. Safra Center, heads a group that conducts research on novel synthetic methods to chemically synthesize homogeneous post-translationally modified proteins, such as ubiquitinated proteins, for structural and functional analyses. In addition, the Brik group is developing new peptidomimetic structures as anti-infection agents. Brik's work is best summed up by the Award Committee for the 2012 Teva Award for Excellence in Memory of Eli Hurvitz: "Prof. Ashraf Brik is awarded the prize for innovative and groundbreaking research. ... His laboratory develops novel methods to synthesize homogenous proteins for a variety of structural and functional studies. Brik's research... has become a focus of global interest. His work has the potential to lead to significant new contributions in research." Brik has also received many other awards, including the 2011 Israel Chemical Society Prize for Outstanding Young Chemist and the Tetrahedron Young Investigator Award - Bioorganic & Medicinal Chemistry in 2013. Within BGU, he was named on the Dean's


*Prof. Ashraf Brik*

Honors List of the Faculty of Natural Sciences as an Excellent Researcher in 2009 and is the recipient of the 2012 Toronto Prize.

Brik has published over 70 papers in top-tier peer-reviewed journals, including Proceedings of the National Academy of Science, Journal of the American Chemical Society and Angewandte

Chemie International Edition, with many of the papers being highlighted as 'editor's choice' in other journals. Research in the Brik Lab is funded by several international and local funding agencies and foundations, including ISF, BSF, and HFSP.

Prof. Gonen Ashkenasy of the Department of Chemistry is the founder and chair of Edmond J. Safra Center. Since joining BGU in 2006, he has established an active laboratory devoted to the design and synthesis of multi-component chemical systems, termed molecular networks, and to the analysis of their dynamic self-organization. This field of study, known as systems chemistry, is inspired by the complexity and high-order of molecular networks within cells. Within this framework, Ashkenasy and his team also study structure-function relationships of peptides and proteins, including protein folding and protein interactions with small molecules and bio-macromolecules.

Ashkenasy has already published more than 40 research papers in the best journals in Chemistry (Angewandte Chemie, Journal of the American Chemical Society, Chemical Communications, ACS Nano, Biomaterials) and Physics (Physical Review Letters, Journal of Chemical Physics and ChemPhysChem). He has also described this research in presentations and invited plenary lectures at conferences all over the world. In addition to grants from the ISF, he has been awarded a number of prestigious international grants from the following funding agencies: BSF; HFSP; the European Union FP7 Programme – an ERC Starting Grant and an International Training Network (ITN) grant; and two Germany-Israel Foundations, DIP and GIF. Starting from 2013, Ashkenasy is serving as the Vice-Chair of the COST (an intergovernmental framework for European Cooperation in Science and Technology) Action on Complex Chemical Systems CM1304 and the Chair of the Israel Society for Astrobiology and the Study of the Origin of Life (Ilasol).

*Prof. Nurit Ashkenasy and Prof. Gonen Ashkenasy – partners at home and in the lab*

Prof. Nurit Ashkenasy of the Department of Materials Engineering is a member of the Edmond J. Safra Center and of the Ilse Katz Institute for Nanoscale Science and Technology. She and the members of her laboratory are active in the field of bioelectronics and biosensing. Inspired by the structure and function of natural proteins, they design and prepare peptides that are used as components of electronic or biosensing devices. They have demonstrated the feasibility of using specifically designed peptides as building blocks for advanced electronic and biosensing devices. Ashkenasy has presented the research findings of her group in more than 20 papers in high-impact journals, including Journal of the American Chemical Society, Journal of Materials Chemistry, ACS Nano, and Nanoscale, and in invited plenary lectures and other lectures in Europe and the USA. She has received funding from prestigious funding agencies, such as the ISF and two Germany-Israel Foundations – DIP and GIF – and from industrial concerns, such as Intel.

# The Bengis Center for Entrepreneurship and Hi-Tech Management

## Prof. Dafna Schwartz, Director

*http://in.bgu.ac.il/fom/Bengis/Pages/default.aspx*

### Mission

The Bengis Center was established to respond to the growing need faced by entrepreneurs and corporations alike to define the entrepreneurial character of business in Israel and abroad. The Center serves as a catalyst and facilitator, creating and channeling innovation and entrepreneurial activity within the University, within the Negev community, and throughout Israel. The Center promotes research and supports all faculty members and students who are engaged in innovation and entrepreneurial activities by encouraging applied academic research; educating a future cadre of scientists and business leaders dedicated to converting technological ideas into new marketable products and businesses; and offering assistance to individuals, startups and companies.

### Research and Entrepreneurship Activities

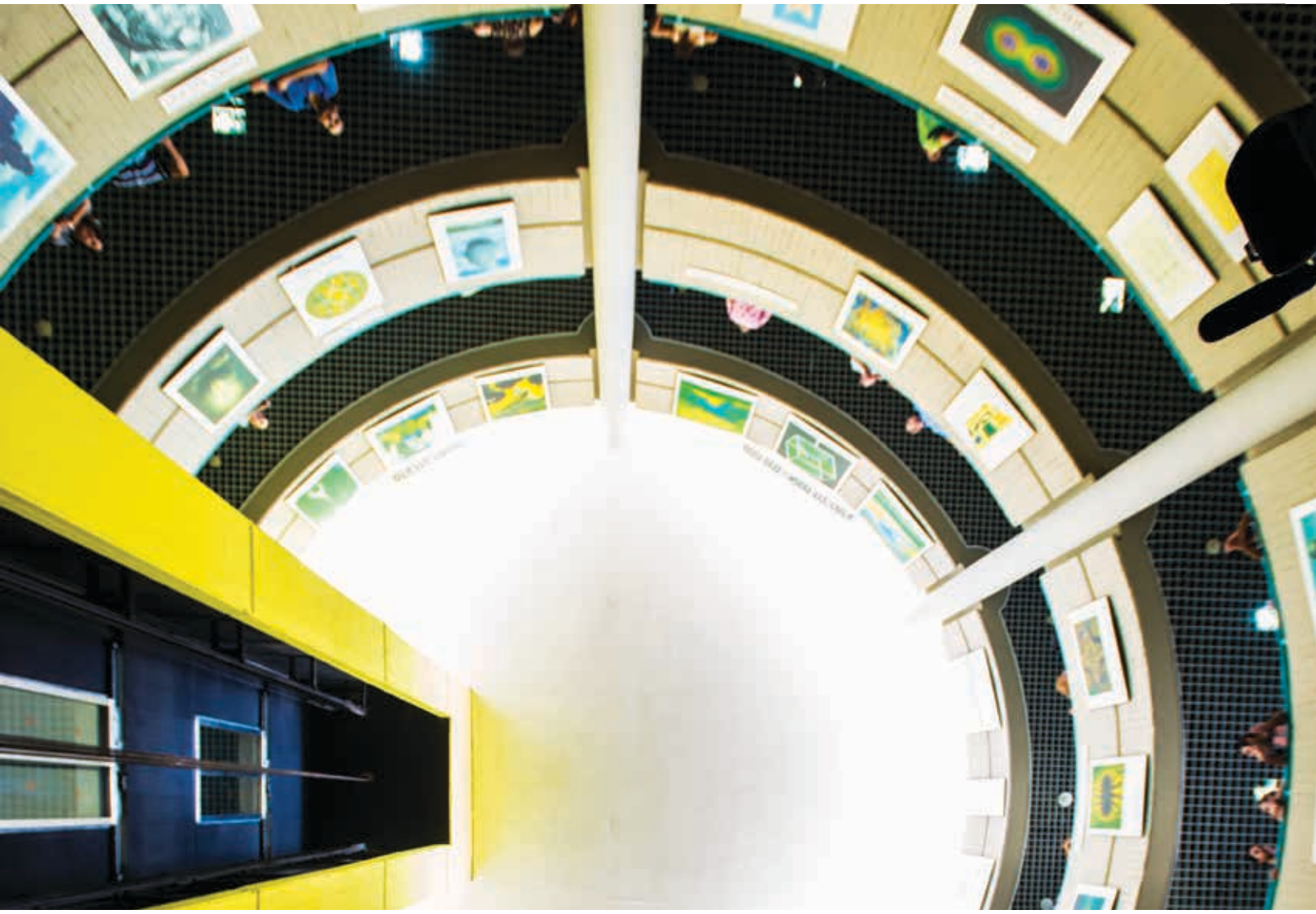
Over the past decade, there has been a significant increase in the activities of the Center, which have, in turn, generated a great deal of interest in entrepreneurship and innovation on the campus. Furthermore, entrepreneurship and innovation have become increasingly popular on the research agenda of the Faculty of Management and other faculties.

The Center has worked to expand its support for researchers, while acquiring permissions to access electronic databases in the fields of entrepreneurship and innovation, supporting research activities, and encouraging collaborations between BGU researchers and other institutions. In addition, the Center has taken an active role in academic gatherings, such as the Regional Science Association conferences and applied seminars and workshops. Those events have served as a platform for leading personalities in the field of entrepreneurship to take part in discussions on innovative and entrepreneurial research and to transfer knowledge to small and medium businesses. This knowledge has also served to boost regional economic development and to position entrepreneurship as a vehicle for employment in the Negev, with emphasis on the Bedouin Sector.

The Center has initiated various activities within the framework of academic courses, such as bringing entrepreneurs, policy makers, leading business people and foreign scholars as guest lecturers and facilitating collaboration with the businesses sector in course assignments. A unique activity in this regard is the workshop "Innovation and Entrepreneurship in a Growing Economy: Brazil" that is held in collaboration with the University of Fortaleza (UNIFOR), the Federal University of Ceare (UFC) and the industrialists association of the Brazilian state of Ceará. The above activities are merely a sample of the actions designed to expose students to concepts in innovation, entrepreneurship, and technology management, thereby generating interest among future generations of researchers in those areas of research.

Finally, the Center has organized a series of major events, many on an annual basis:

- Annual Business Plan Competition - to advance business ideas and to transfer knowledge, expertise and tools for developing ideas into business initiatives
- Annual Global Entrepreneurship Week - a wide variety of activities to mark the Global Entrepreneurship Week
- Annual Innovation Un-conference - the content of the event is determined by the participants, who take an active role in preparing and executing it (over 130 active participants and 3,200 attendees at the 2013 event)
- Other events to promote entrepreneurship and innovation, such as "Entrepreneurship Over Coffee" (students meet entrepreneurs at a campus cafe); "Sharks in the Negev" (students present technological business ideas to prospective investors); "Young Entrepreneurship Event", and "Environmental Entrepreneurship Contest in the Negev".



Prof. Dafna Schwartz is an economist who serves as the Director of the Bengis Center for Entrepreneurship and Hi-Tech Management and as the head of the MBA track in Entrepreneurship and High-Tech Management of BGU's Department of Business Administration, Guilford Glazer Faculty of Business and Management. Her main research interests are entrepreneurship and innovation, economic development, the high-tech industry, start-ups, small- and medium-sized enterprises (SMEs), and regional and local economic development. She has experience as a board member of many leading Israeli corporations. Currently, she serves as a board member of Teva Pharmaceutical Industries Ltd., Strauss Group Ltd. and Bank Hapoalim Ltd. Schwartz is a member of the Israel National Council for Research and Development and a member of the EU Expert Group on "Policy Relevant Research on Entrepreneurship and SMEs" of the Enterprise and Industry Director General. She is also a Member of the Committee for the Prime Minister's Prize for Entrepreneurship & Innovation. In 2011, she was named as one of the 100 most influential people in Israel's economy by the TheMarker, a leading Israeli economic journal.

*Prof. Dafna Schwartz*

# Jacques Loeb Centre for the History and Philosophy of the Life Sciences

## Prof. Ute Deichmann, Director

*http://in.bgu.ac.il/en/loeb/Pages/default.aspx*

### Mission

The Centre was founded in October 2008 with Prof. Ute Deichmann as founding director and with the mission to promote the interaction of scientists with historians and philosophers engaged in the study of the the life sciences, in the broadest sense. It is thus not by chance that the Centre is named after German-Jewish-American physiologist Jacques Loeb (1859-1924), who was a legendary experimentalist and seminal thinker in the history of biology. The Centre was established in the belief that the history and philosophy of science should not be separated, with history providing details of scientific developments and philosophy leading to an understanding of science, its progress and its pitfalls. With its focus on the experimental life sciences, including chemistry and physics, and its interdisciplinary and cross-faculty nature, the Centre is unique, not only in Israel but the world over.


### Activities

The Centre pursues a wide range of investigations into the history and philosophy of modern experimental life sciences and serves as an interdisciplinary forum. Research topics include, but are not restricted to: history of ideas in modern biology; analysis of scientific progress and research practices; the ethics of research; the influence of politics and various ideologies on the conduct of science; and the nature of the connections between bioscientists and industry. The Centre also organizes international conferences and workshops, such as the 'Origin of Life' conference in 2011.


*Prof. Ute Deichmann*

Prof. Ute Deichmann has published *Biologists under Hitler* and *Chemists and Biochemists in the Nazi Era* (in German) and numerous papers on science and scientists in Nazi Germany and their forced emigration. Her current research focuses on the beginnings of Israeli-German science collaboration and various topics related to the history and philosophy of modern life sciences. In this field of endeavor, she has published numerous papers and co-edited several volumes, the most recent of which is *Synthetic Life. Scientific Historical and Ethical Perspectives*. Deichmann is the recipient of several prizes, including BGU's Ladislaus Laszt International and Social Concern Award, the Gmelin Beilstein Medal of the Society of German Chemists, and an Outstanding Paper Award from the Division of the History of Chemistry of the American Chemical Society for *'Molecular'* versus *'Colloidal': Controversies in Biology and Biochemistry, 1900-1940*.

# Center for the Study of Conversion and Inter-Religious Encounters

## Prof. Chaim (Harvey) Hames, Director

*http://in.bgu.ac.il/en/csoc/Pages/default.aspx*

### Framework and Mission

The Center began operating in May 2013 as part of the Israeli Centers of Research Excellence (I-CORE) program established by the Government of Israel to strengthen the long-term positioning of Israel's academic research by offering new academic positions and promoting research collaborations between researchers from different institutions. The research effort is led by BGU, with the collaborating universities being Bar-Ilan University, The Hebrew University of Jerusalem, The Open University of Israel, and Haifa University. The mission of the Center is to examine religious conversion from a broad variety of perspectives (historical, cultural, psychological, sociological, phenomenological, legal and more) with the intent of comparing and understanding the process of conversion and its effects on different religious communities and on issues relating to individual and communal identities.

### Activities

The main thrust of the Center's activities will be the creation of an open access database that will register as many records of conversion from one religion to another as possible from the early Middle Ages until the early Modern Period. The database will cover as much biographical information as is available, including the place and date (or approximate date) of conversion, the age of the convert, and the motives for conversion. It will include descriptions of the process as recorded in the sources and information on former and present religion, career and professional status before and after conversion, familial ties and connections with other converts, and reaction to the conversion. Finally, it will list works written by the convert and works that refer to the convert, record the languages used by the convert, and provide a bibliography of all the available primary and secondary sources. All the materials written in languages other than English will be translated into English so that the database will be useful for those without the linguistic training necessary to read the primary sources. The Center will also prepare a textbook on conversion (Readings on Conversion: Judaism, Christianity and Islam), which will comprise translations of a broad variety of primary sources over time, space and themes.

### Special Events

The Center holds bi-weekly seminars (details of which can be found on the Webpage of the Center). At the end of May 2014, the Center will host an international conference Texts of Conversion, the first of a number of international conferences that will draw leading scholars from around the world whose research interests are focused on mass and individual conversions.

*Prof. Chaim (Harvey) Hames*

Prof. Chaim (Harvey) Hames is Chair of the Department of General History and Director of the Center for the Study of Conversion and Inter-Religious Encounters. He studies medieval and modern religious polemics, interaction and dialogue, and Jewish, Christian and Muslim mysticism. Hames was a senior researcher on the ERC Starting Grant (2008-2011) of Alexander Fidora (Universitat Autònoma de Barcelona), which focused on the translation of Latin texts into Hebrew, and is currently senior researcher on Fidora's ERC Consolidators Grant, dealing with the medieval translations of the Babylonian Talmud into Latin. At present, he is also working on the first complete translation of the four gospels into Hebrew funded by the Israel Science Foundation (ISF). Hames has authored four books, edited three collections, and written over 30 articles.

# The Ben-Gurion Research Institute for the Study of Israel and Zionism

## Dr. Paula Kabalo, Director

*http://in.bgu.ac.il/bgi/Pages/default.aspx*

### Mission

Established in 1982 under an agreement between BGU and the Ben-Gurion Heritage Institute, the Ben-Gurion Institute for the Study of Israel and Zionism (BGI) researches and documents the history of the State of Israel. The Institute takes an integrative research approach that eliminates barriers between disciplines and fosters the development of fresh and innovative areas of research on Israel.

### Activities

BGI researchers focus on the following themes:

- David Ben-Gurion and the nature of Israeli leadership – Ben-Gurion's crucial decisions in the making of Israel and the shaping of Israeli society and polity; Israeli leadership both from the perspective of the individual leader and through the prism of political parties and ideological movements
- Political culture, past and present – the political culture of Israel and its pre-state structural roots and the role of political movements in shaping public discourse and as agents of change and democracy
- Israel and the Jewish world – movements, people, and communities: community transition, immigration to Israel and elsewhere, and the challenges of integration and absorption
- Society and education in Israel – the history of education and civil society organizations; civic status of minority groups and sub-communities and their part in the making of a hybrid Israeli culture; realms of memory and rituals of commemoration and nation building
- Arab-Israel conflict and the shaping of national security policies – the development of Israel's national security outlook; negotiations and relations with the Arab world
- Israel and the Holocaust – responses in Israel to the Holocaust at the political, philosophical, and cultural levels; Holocaust survivors in Israel; commemoration and remembrance of the Holocaust in the Israeli public and private spheres.

### The Ben-Gurion Archives and Specialized Library

The archives contain more than 3 million items that reflect the history of Israel from the early 20th century up to the present, including the personal papers of David Ben-Gurion and other prominent Zionist figures and special document sections collected from other archives, both in Israel and abroad. The archive is currently digitalizing its documents, and thousands of documents are already fully searchable online. The library, which specializes in Israel and modern Jewish studies, houses collections of newspaper articles on David Ben-Gurion and booklets, almanacs, working papers, and journals of the British Mandate Government, pre-state national institutions, early Israel governments, the Zionist movement, and the Jewish world.

### The Publication Unit

BGI publishes two leading peer-reviewed journals in Israel studies—*Iyunim Bitkumat Israel* (in Hebrew) and Israel Studies (in English), the latter being co-sponsored by Brandeis University and published in cooperation with the Indiana University Press. The Institute also publishes monographs and anthologies—more than 120 academic works to date, many of which have won prestigious prizes.

# HEKSHERIM - The Research Institute for Jewish and Israeli Literature & Culture

## Prof. Yigal Schwartz, Director

*http://in.bgu.ac.il/heksherim/Pages/default.aspx*

### Mission

The mission of Heksherim ("Contexts") is to research and promote Israeli literature and culture. Its activities include research studies on Israeli authors and poets, publication of prestigious book series and journals, arranging conferences and workshops, and establishing and maintaining an archive of Israel's leading writers of poetry, prose and drama dating from the establishment of the State of Israel. A cross-section of its activities are described below.

### Research Projects

Recently completed studies include: a major work on the corpus of apocalyptic-dystopic works published following the 1973 Yom Kippur War; a study linking the conceptual, esthetic, poetic, and biographical aspects of the work of Leah Goldberg; a study of the autobiography of literature critic Avraham Uri Korner; a project to collect, document, and analyze Israeli-Palestinian love stories in conflict zones; a collection of critiques of the works of Yehoshua Kenaz; and a biographical study of Meir Ariel. In parallel, work is underway on a comprehensive book on Israeli fiction, which will include the 'First Israelis', the authors of the literary transition from modernism to postmodernism, and the literary scene of second- and third-generation Israelis with origins in Europe, North Africa, and Asia. Finally, an encyclopedia of 1,234 entries on authors, poets, dramatists, essayists and critics of Hebrew Literature since the establishment of the State of Israel is in the final stages of preparation for publication.

### The Archive Project

This project aims to turn the Heksherim "First Israelis" archives into an information and research center for academia and the general public. The Archive Project includes the complete archives of Amos Oz, Aharon Appelfeld, Nissim Aloni, David Schütz, David Avidan, Ruth Almog and Shulamit Hareven. It also features important sections from the archives of Yocheved Bat Miriam, Yehuda Amichai, Zelda, S. Yizhar, Dahlia Ravikovitch, and Nehemiah Rappoport.

### Publications

*Mikan* (From Here) is a highly esteemed research journal in literary and cultural studies that is issued periodically. *Massa Kritit* (Critical Mass) is a series of books on studies of Hebrew Literature. Both are published in cooperation with the Kinneret Zmora-Bitan Dvir publishing house. Hekshrim also publishes a multidisciplinary English-language e-journal, BGU Review (supported by the Axel Springer Foundation).

### Conferences, Workshops and Readings

Heksherim organizes cultural evenings and conferences in Israel and around the world to promote Israeli authors and books.

# Humanities Research at BGU

## BGU on the International Stage

Research in the humanities at BGU covers a wide range of subject matter, from the more traditional fields, such as ancient, medieval, and modern history, to themes that have acquired relevance only in recent decades, such as modern linguistics, gender studies, and African history. Faculty members in the humanities publish regularly on the international academic stage – both books and papers – and are active in organizing international meetings at BGU. Among these, an international workshop entitled *Rethinking Rationality* was organized in January 2012 by the Department of Philosophy, hosting three Nobel Prize Laureates, Robert Aumann, Daniel Kahnemann, and Reinhard Selten, and Israel Prize Winner Menahem Yaari. Recently, the same Department organized yet another international conference, this time on *Kant's Conception of Empirical Knowledge*, hosting speakers from, among others, the University of California (San Diego and Berkeley), Cornell University, Humboldt University, King's College London, and the University of Cambridge. The Department of Foreign Linguistics and Literatures received funding from the Israel Science Foundation to hold two workshops, one in 2007, *Sound Patterns of Syntax*, which hosted speakers from the USA, Germany, Norway, Japan, Hungary, and Portugal, and the other in 2008, *Literature, Book History and the Anxiety of Disciplinarity*, with guest speakers from the University of Pennsylvania and Harvard University, among others. In spring 2013, the Department of Jewish Thought organized an international conference on Jewish prayer with speakers from all the Israeli Universities, the University of Cambridge, and the Hebrew Union College in Cincinnati. In January 2014, the Arts Department hosted the annual meeting of the Israeli Association of Medieval and Early Modern Art History, with an invited a keynote speaker from New York University. The same Department is currently planning an international workshop on imagery on maps and in travel literature to be held in 2015. The workshop will host about fifteen speakers from the USA and Europe.

## Ten Years of Transformation

The primary stage for the publication of research in the humanities is the academic book. Despite the fact that budgetary restrictions and cuts have affected the publication arena worldwide in the past ten years, making it more and more competitive, BGU scholars in the Humanities still published a wide range of scholarly books through various academic presses of international reputation (including Oxford University Press, MIT Press, Cambridge University Press, Pennsylvania State University Press, Harvard University Press, Yale University Press, University of California Press, Stanford University Press, and University of Pennsylvania Press). More importantly, the recent decade has seen a significant increase in the number of books published by BGU scholars: More than 100 books were authored by BGU faculty members, and about 100 more books were edited. Many of the books published by BGU scholars are examples of outstanding scholarship: they form part of the most relevant academic discourse of the day, and they stand out in their innovative approaches and their interdisciplinary, contextualizing methodologies.

Several research groups and centers in the humanities have thrived in the past decade. Noteworthy among these are: the Negev Bedouin Dialect Project, initiated in 2003 as part of a National Center of Excellence Project that includes researchers from Haifa University, The Hebrew University of Jerusalem, and BGU (Department of Hebrew Language); the Moshe David Gaon Center for Ladino Culture, which promotes research on the culture of communities of the Sefardi Diaspora; and The Goldstein-Goren International Center for Jewish Thought, established in 2000 with the goal to promote the knowledge and research of Jewish thought both in Israel and around the world. Since its establishment, the Goldstein-Goren Center has organized a series of international workshops and supported outstanding graduate students and post-doctoral researchers. Two other important centers are

described in detail in this publication, Heksherim - The Research Institute for Jewish & Israeli Literature & Culture and The Center for the Study of Conversion and Inter-Religious Encounters.

In recent years, there has been a significant increase in obtaining research funding in the Humanities, from both national and binational (German-Israeli Foundation for Scientific Research and Development) funding agencies. In parallel, there has been a substantial increase in the number of research students - from approximately 100 doctoral students in the humanities in 2003 to over 160 in 2013.

## Outlook for the Future

Our main goal for the future concerns participation in the large funding schemes offered both nationally and internationally (especially Horizon 2020). The recent funding by the Israel Science Foundation of an I-CORE (Israeli Centers of Research Excellence) project led by BGU for the establishment of the Center for the Study of Conversion and Inter-Religious Encounters is an impressive start, and we would like to see more such centers established at BGU. We will also encourage senior scholars to apply for (and win) funding from the EU funding schemes for projects that will attract young scholars, post-doctoral scholars, and outstanding doctoral candidates and that will enable us to provide budgets for high-level international workshops and conferences.

*Prof. Katrin Kogman-Appel*

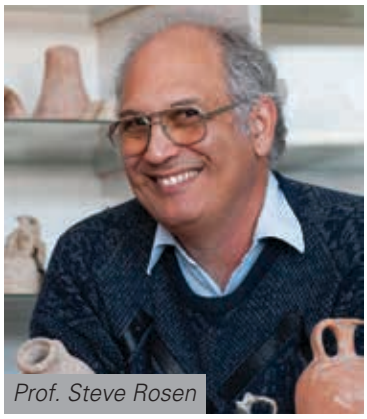
Prof. Katrin Kogman-Appel, Deputy Dean of the Faculty of Humanities and Social Sciences and member of the Department of the Arts, is the incumbent of the Evelyn Metz Memorial Research Chair in Art. A finalist of the National Jewish Book Award on scholarship for her recent "A Mahzor from Worms: Art and Religion in a Medieval Jewish Community," Kogman-Appel is the author of several other books: "Jewish Book Art Between Islam and Christianity: Bible Decoration in Spain," which appeared in 2004, was followed in 2006 by "The Illuminated Haggadot From Medieval Spain: Biblical Imagery and the Passover Holiday." The latter book was a 2007 Choice Outstanding Academic Title Winner and also won the 2008 Premio del Rey Prize of the American Historical Association. Her current research projects include: "Cresques Abraham: Mapmaking in Fourteenth-Century Mallorca" and "Joel ben Simeon: A Jewish Scribe and Artist of the Fifteenth Century." Kogman-Appel's work is supported by grants from the Israel Science Foundation (ISF). From 2007 to 2009, she served as a founding member and chair of Imago - Israeli Association of Visual Culture in the Middle Ages. She is currently a member of the executive board of the World Union of Jewish Studies.

*Prof. Yitzhak Hen*

Prof. Yitzhak Hen, incumbent of the Anna and Sam Lopin Chair in History, is a member of the Department of General History. He is the author and editor of more than ten books focusing on early medieval social and religious history of the West, culture and tradition in the Barbarian kingdom, and early medieval Christian Liturgy. Among his books are "The Royal Patronage of Liturgy in Frankish Gaul" (2001) and "Roman Barbarians: the Royal Court and Culture in the Early Medieval West" (2007). He is currently writing a book on "Western Arianism: Politics and Religious Culture in the Early Medieval West," to be published by Cambridge University Press. He is also the general editor of the series "Cultural Encounters in Late Antiquity and the

Middle Ages" (Brepols Publishers). Hen was a fellow in residence at the Netherlands Institute for Advanced Study (NIAS), a member of the Institute for Advanced Studies at Princeton (IAS), and Visiting Fellow at Clare Hall, University of Cambridge; since 2008 he is a Life Member of that College. His research is funded by competitive funding agencies, including the Israel Science Foundation (ISF) and the German-Israeli Foundation (GIF).

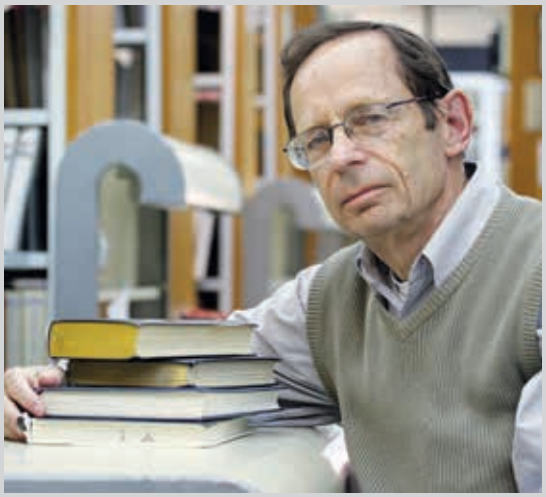
Prof. Steve Rosen, incumbent of the Canada Chair in Near Eastern Archaeology, is Deputy Rector and a member of the Department of Bible, Archaeology, and Ancient Near East. His research is focused on two main areas, the archaeology of desert nomads and prehistoric stone tools. He has directed excavations of archaeological sites, particularly in the Negev, from as early as 200,000 years ago to recent times. His most recent research involves the evolution of desert pastoral societies over the long term, with the Negev as a case study. Rosen has written four books and has published over 150 professional articles in leading archaeology journals and anthologies. His book "Lithics after the Stone Age" won the 1998 Wright Publication Prize of the American Schools of Oriental Research. He served as the co-editor of the Journal of the Israel Prehistoric Society from 1985-1992 and editor from 2005-2012. He is a member of the Israel Archaeological Council and has chaired the subcommittee on archaeological research for the Israel Academy of Sciences.



*Prof. Steve Rosen*

## Prof. Gerald Blidstein, a Leading Scholar in Jewish Thought

Prof. Gerald (Ya'acov) Blidstein is Professor Emeritus in the Goren Goldstein Department of Jewish Thought. At BGU, he has served as Dean of the Faculty of Humanities and Social Sciences, Chairman of the Goldstein-Goren Department of Jewish Thought and Head of the Goldstein-Goren International Center for Jewish Thought. In 2006, Blidstein was awarded Israel's highest honor, the Israel Prize for Jewish Thought, and in 2007 he was inducted as a member of the Israel Academy of Sciences and Humanities. He is also a member of the European Academy of Sciences and Arts.



Blidstein is an internationally renowned scholar in Jewish law and the philosophy of Maimonides, with a special emphasis on political philosophy, and is considered one of the foremost authorities on the Mishneh Torah. He has written extensively on the legal thought of Maimonides and the relationship between law and ethics in Jewish law, and he has also published numerous studies on the history of prayer and liturgy from ancient times to the present. He has authored several books, including: "Honor Thy Father and Mother: Filial Responsibility in Jewish Law and Ethics" (1975), "Political Principles in Maimonidean Law" (1983; 2nd edn, 2001), and "Authority and Dissent in Maimonidean Law" (2002).

# Pap(p)o - more than a name

Dr. Doron Pappo heads a research group working in the field of organic chemistry. He and his team are engaged in developing novel sustainable cross-coupling reactions to convert simple molecules into complex architectures in an economically acceptable and environmentally friendly manner. In many cases, the developed technology enables the preparation of valuable biologically active compounds in a short synthetic scheme, which provides the basis for drug development. Pappo joined the Department of Chemistry in 2011 after a stint in industrial research and hence brings an application-oriented approach to his basic research. He is the recipient of ISF (Israel Science Foundation), BSF (United States-Israel Bi-national Science Foundation) and MOST (Israel Ministry of Science & Technology) research grants, and his work has been published in high-impact journals, such as Journal of the American Chemistry Society, Angewandte Chemie, Chemical Communications, Chemistry - A European Journal, and Organic Letters.

Dr. Niv Papo is a member of the Avram and Stella Goldstein-Goren Department of Biotechnology Engineering and of the National Institute for Biotechnology in the Negev (NIBN). Papo's research group focuses on developing combinatorial and rational synthetic tools and applying them to engineer new biological agents capable of targeting the neovasculature. He and his group then exploit their findings for applications in regenerative medicine and cancer imaging and therapy. Papo's work has been acknowledged both internationally and at home: in 2013 he received the Young Investigator Award from the Prostate Cancer Foundation for his ground breaking cancer research, and in 2014 he was awarded the Krill Prize in the Life Sciences. Papo has received a number of competitive research grants, including two from the EU FP7 Framework Programme—the prestigious European Research Council (ERC) Starting Grant and the Marie Curie Career Integration Grant (CIG).

Dr. Eliezer Papo of the Department of Hebrew Literature is Deputy Director of the Moshe David Gaon Center for Ladino Studies and head of the newly formed Sephardic Studies Research Institute. His research centers on Sephardic culture and literature. In January 2014 he received the prestigious Ben-Tzvi award for his latest book, "And Thou Shall Jest with Your Son: Judeo-Spanish Parodies on the Passover Haggadah." In the same week he was appointed by the Israel Ministry of Sport and Culture to be one of two representatives of Israeli academia in the National Authority for Ladino Culture. He has published many articles about Sephardic culture and literature in eight languages and four works of fiction — one in Ladino and three in Serbo-Croatian. Dr. Papo is also the main protagonist and moderator of the 2004 film El Ultimo Sefaradi (The Last Sephardic Jew), which focuses on the present condition of Ladino worldwide.


*Prof. Aviad Raz*

## Prof. Aviad Raz

is a member of BGU's Department of Sociology and Anthropology. In 2012-14 he was an AICE Visiting Professor in the Department of Sociology, University of California San Diego. Raz's research focuses on organizational and medical sociology, particularly the social and bioethical aspects of new reproductive technologies, genetics, and patient organizations. He also conducts research on organizational culture, health governance, and entrepreneurship. He has written 7 books and over 45 articles and chapters on these topics. His research projects on the social and organizational aspects of genetic testing in Jewish and Muslim communities have been supported by competitive funding agencies, including ISF, GIF, and BSF. Raz is also involved in collaborative research comparing Israel and Germany, two countries that generally represent opposing regulations and policies regarding reproducive genetics. Since 2011, he has been a member of the Steering Committee of I-CORE - the Israeli Centers of Research Excellence, an initiative of the Planning and Budgeting Committee and the Government of Israel.


*Dr. Sharon Pardo*

## Dr. Sharon Pardo

of the Department of Politics and Government is the only holder of the lifetime Jean Monnet Chair ad personam in European Studies in Israel and the Director of the Center for the Study of European Politics and Society (CSEPS), the only Jean Monnet Center of Excellence in Israel (both at BGU). Pardo is the author and co-author of three books on the EU, co-editor of the book series 'Europe and the World', and author of several dozen book chapters, reports and articles in leading peer-reviewed journals. His research has been supported by competitive research funding agencies, including ISF, GIF and the EU [MEDA, FP7, Lifelong Learning Programme, and Tempus Programme]. Pardo's personal commitment to promoting knowledge about the European integration process and its values beyond the confines of the academic world is reflected in his EU-supported community-based project, 'Teaching the Dynamics of the European Union in Schools.'


*Prof. Yair Neuman*

## Prof. Yair Neuman

is the Head of the Department of Education and a member of the Homeland Security Institute. He is also co-director of the Behavioral Insights Research Laboratory of the University of Toronto and a Senior Fellow of the Brain Sciences Foundation (USA). He is an interdisciplinary researcher whose work ranges from the psychology of thinking to natural language processing. Among his major contributions is the development of cognitively inspired algorithms for the analysis of metaphorical language. Combining ancient hermeneutical traditions with modern scientific knowledge, Neuman addresses problems from a creative perspective: he has developed new tools for profiling political leaders, an innovative methodology for studying transition points in dynamical systems, and novel interpretative approaches for reading texts. His current research focuses on a novel approach for studying personality through the use of computational tools. Neuman is the author of three academic books and over 70 peer-reviewed publications.

# Medical Research at BGU

## Current Activities

Bio-medical research at BGU covers the entire spectrum of medical-related fields, with emphasis on neurosciences, infectious diseases, vaccines, cardio-metabolic health, genetics, psychiatry, diabetes, and integrative cancer research. Much of this research is carried out in close cooperation with the staff of the Soroka University Medical Center (Beer-Sheva) and the Barzilai Medical Center (Ashkelon). In this context, BGU's commitment to community involvement is reflected in research focusing on the health problems of the Negev, especially in the fields of genetics, nutrition, and vaccines, as follows.

Researchers from the Shraga Segal Department of Microbiology, Immunology and Genetics play a pivotal role in solving genetic puzzles for the benefit of the community. Through the generation and implementation of novel technologies, they have deciphered the causes of certain genetic diseases in both the Bedouin and Jewish populations of the Negev. The focus on genetic research, which includes the identification and characterization of genes associated with human diseases, has led, so far, to the identification of the molecular basis of fifteen human diseases, including myopia, motility disorders of the gastrointestinal tract, nerve injury and repair, osteoblastoma, a variant of seborrheic dermatitis and psoriasis, and eight severe neurodegenerative diseases. The findings, which are of both scientific and medical interest, were immediately implemented through the massive government-funded program of free carrier testing and prenatal diagnosis. Researchers from the Departments of Public Health and Clinical Biochemistry and Pharmacology have initiated an international multidisciplinary study to perform innovative dietary clinical trials. The findings, which have been published at the various stages of the trials in the New England Journal of Medicine, revealed that low-carbohydrate and Mediterranean diets may be safer and more effective in achieving weight loss than the standard, medically prescribed low-fat diet. Researchers from the Department of Pediatric Infectious Diseases have established a national network to provide advice on care for pediatric infectious diseases. One of their outstanding contributions has been the development of vaccinations against hepatitis A and pneumococcus, which have changed the pediatric vaccination program now included in the government's "basket" of health services.

In addition to the core research mentioned above, research in the area of brain disorders is particularly noteworthy: Researchers from the Department of Physiology and Cell Biology are key members of the Zlotowski Center for Neuroscience (described in detail elsewhere). Their research focuses on understanding brain diseases through exploring the interactions between the vascular and neuronal systems within the cerebral cortex, the dialogue between the immune system and the brain, and molecular analysis of metabolism in the brain. The Department's excellence in the last-mentioned area was recently acknowledged with the award to three of its researchers of a prestigious DIP German-Israeli Project Cooperation grant.

## Ten Years of Transformation

In the past 10 years, BGU has come to be known as an important player in the international bio-medical research arena. Frontier research is conducted by a core group of highly respected senior faculty that has been complemented over the past few years by a cadre of young scientists returning to Israel from prestigious institutes abroad. In addition, interdisciplinary collaborations on bio-medical topics have been forged between researchers of BGU's Faculties of Health, Natural, and Engineering Sciences. In parallel, to promote synergistic cooperative research projects, in which groups of medical researchers with different and complementary fields of expertise (PhDs and MDs) are gathered together to thoroughly investigate bio-medical questions, the management of the Faculty of Health Sciences has launched a new

Research Excellence Initiative. It is believed such projects will not only enhance bio-medical research at BGU but will also determine the bio-medical research fields that will constitute the future centers of excellence. These projects have been complemented by research funded by prestigious funding sources, including the Israel Science Foundation (ISF), the Bi-national Israel-US Science Foundation (BSF), the German-Israeli Foundation (GIF), and the EU Seventh Framework. Numerous studies have been published in prestigious journals, including the New England Journal of Medicine, Nature, Nature-Genetics, Nature-Immunology, Chest, American Journal of Respiratory and Critical Care Medicine.

## Vision for the Future

"Only through a united effort by the State … by a people ready for a great voluntary effort, by a youth bold in spirit and inspired by creative heroism, by scientists liberated from the bonds of conventional thought and capable of probing deep into the special problems of this country … we can succeed in carrying out the great and fateful task of developing the South and the Negev" (David Ben-Gurion).

The Negev Desert comprises over 60% of the land of Israel. Its residents form one of the most unusual ethnic mixtures in the world: immigrants from North Africa, Ethiopia, India, Europe, North and South America, and the Republics of the former Soviet Union, Bedouin Arabs and Jews born in Israel. In keeping with the "Beer-Sheva Spirit," BGU views its approach to mental, social, cultural and inter-cultural aspects of life as an inseparable part of study, research, health promotion, and treatment of the physical and mental health of the individual. Through the Faculty of Health Sciences, BGU will continue to support the advancement of health services in the community by contributing to the creation of a cooperative Negev community that integrates faculty members, directors and staff of the affiliated medical centers, patients, Negev inhabitants, and public supporters of the Negev. The Faculty will continue to promote a comprehensive approach to medical research that encourages creativity and academic freedom coupled with transparency, responsibility, affectivity, and administrative and ethical accountability.


*Prof. Angel Porgador*

Prof. Angel Porgador, Vice-Dean of the Faculty of Health Sciences and member of the Shraga Segal Department of Microbiology, Immunology and Genetics, seeks to understand the role of natural killer (NK) cells in the eradication of pathogens and tumors. The goal of the research in Porgador's laboratory is to elucidate how NK cells kill their targets and to identify relevant ligands that interact with natural cytotoxicity receptors expressed by NK cells. His team identifies essential viral and tumoral ligands and then follows up with applied studies aimed at disease diagnosis and therapy. Porgador's research has been published in such prestigious journals as Nature, Immunity, PNAS, the Journal of Experimental Medicine, and the Journal of Immunology, and his papers have been cited more than 5000 times. His group has been awarded more than 40 grants from competitive funding agencies, including ISF, BSF, and the Germany Israel DKFZ-MOST program, and several grants from the EU FP7 Framework Programme. In 2012, Porgador was awarded the ISF's Klein Prize for an Outstanding Grant Application in Immunology.


*Prof. Iris Shai*

Prof. Iris Shai, a member of the Department of Public Health, is a researcher in the field of nutrition and chronic diseases. Her work centers on long-term randomized controlled dietary intervention trials in large cohorts. Shai led the workplace-based Dietary Intervention Randomized Controlled Trial (DIRECT) addressing the long-term effects and safety of various dietary strategies. She received global recognition for this landmark study, whose results suggested beneficial metabolic effects of low-carbohydrate and Mediterranean diets and provided evidence for diet-induced regression of carotid atherosclerosis. These findings contributed to the updating of the dietary guidelines provided by several leading medical associations throughout the world. Shai's studies have been published in high-impact journals in the field, and her research is supported by competitive granting agencies, including ISF, BSF, NIH, and the European Association for the Study of Diabetes.


*Prof. Assaf Rudich*

Prof. Assaf Rudich of the Department of Clinical Biochemistry and Pharmacology and the National Institute for Biotechnology in the Negev (NIBN) addresses the urgent need to better understand the pathogenesis of obesity, one of the leading health problems of our times. His multi-leveled research program is designed to elucidate the contribution of adipose (fat) tissue in various anatomical locations to diseases that are associated with obesity, including type 2 diabetes, cardiovascular disease, cognitive decline and colon cancer. His studies are supported by grants from competitive national and international granting agencies, and the findings of Rudich and his co-workers have been published in top-tier journals in the field. Prizes awarded to Rudich include the Albert Renold Career Development Award of the European Association for the Study of Diabetes and the Israel Endocrine Society's Lindner Prize for scientific achievements in the field of endocrinology.

Prof. Ron Apte, incumbent of the Irving Isaac Sklar Chair in Endocrinology and Head of the Shraga Segal Department of Microbiology, Immunology and Genetics, is an internationally known expert in tumor biology. The Apte laboratory has pioneered studies on the tumor microenvironment – the normal tissue in which tumors reside – which plays a major role in the malignant process. The laboratory has also conducted break-through research on the role of inflammation in malignant processes. Apte's laboratory investigates the way in which the cytokine interleukin 1 (IL-1), one of the central mediators of inflammation, participates in the different phases of malignancy. The group has shown, for the first time, the efficiency of anti-IL-1 approaches in tumor therapy. Apte is a Charter Member of the International Cancer Microenvironment Society and a member of the European Academy of Tumor Immunology and

*Prof. Ron Apte*

Immunotherapy. In 2010, he was awarded the Samuel and Paula Elkeles Prize for the outstanding scientist of the year in the field of medicine. He is the author of more than 100 peer-reviewed papers and his research is supported by the most prestigious granting agencies, including the EU FP7 Programme, DIP, ISF, and BSF.

## Prof. Ron Dagan, MD, a world renowned researcher in infectious diseases

Prof. Ron Dagan is the Director of the Pediatric Infectious Disease Unit of Soroka University Medical Center and a member of the Pediatric Infectious Disease Department of the Faculty of Health Sciences. He specializes in the study of diseases that are preventable by vaccination. Dagan's epidemiologic and vaccine studies on the hepatitis A virus (responsible for acute liver disease) led to the decision in 1999 by the Israel Ministry of Health to provide free hepatitis A vaccinations to all toddlers, making Israel the first country to do so. The program subsequently became a model for other countries, and hepatitis A has almost completely disappeared. A decade later, a free pneumococcal vaccine (preventing pneumococcal otitis, sinusitis, pneumonia, meningitis, and sepsis) was introduced for infants and toddlers. The research funding garnered to support the studies of Dagan and his team reaches multimillion-dollar numbers. He has published more than 450 peer-reviewed articles, book chapters and editorials and is a member of the editorial boards of several pediatrics and infectious diseases journals. Dagan is the recipient of countless awards, including the Samuel and Paul Elkeles Fund Prize, the Bill Marshall Prize from the European Society for Paediatric Infectious Diseases (ESPID), and the Teva Founders Prize. He has also received recognition for life achievement from the Israeli Pediatric Association, the Israeli Association of Clinical Pediatrics, the International Symposium on Pneumococcus and Pneumococcal Diseases (ISPPD) and the World Society for Pediatric Infectious Diseases (WSPID).

# The BGU Energy Initiative

Prof. Moti Herskowitz, Coordinator

*http://in.bgu.ac.il/en/energy/Pages/default.aspx*

## Focus on the Key Fields of Renewable Energy and Sustainability

Energy-related research covers a wide range of scientific and technological fields - from renewable energy (including solar energy, liquid fuels and fuel cells), through energy efficiency (covering sustainable architecture, thermoelectricity and biomechanical energy), to energy economics. In all these, BGU researchers have maintained high-profile research activities, both fundamental and applied, for more than three decades. The relevant fields of endeavor are presented below, with the exception of the solar energy research conducted at the National Solar Energy Center and the biotechnology-based research conducted at the French Associates Institute for Agriculture and Biotechnology of Drylands, which are described in detail elsewhere.

**Renewable liquid fuels** research at BGU is focused on three main topics: biomass for liquid fuels; water splitting and carbon dioxide reduction; and catalytic processes for production of liquid fuels. Much of the research on these subjects is carried out in the framework of an Israeli Center for Research Excellence (I-CORE) project that focuses on renewable liquid fuels. With members from such diverse departments as Chemical Engineering, Chemistry, and the French Associates Institute, the BGU team participates in four of the five topics of this I-CORE program:
1) Development of plants, algae and cyanobacteria (genetically selected or engineered) for large-scale production (under conventional or dryland growth conditions) of energy-rich biomass as a biofuel feedstock; 2) Non-catalytic conversion of low-grade biomass of any type into a mixture of hydrogen and carbon dioxide, which will serve as a feedstock for liquid fuel production by a catalytic process; 3) Development of catalysts and catalytic processes for the sustainable and environmentally friendly production of liquid fuels from a variety of feedstock materials; 4) Efficient and cost-effective direct conversion of solar energy into liquid fuels by photoelectrolytic and photocatalytic water splitting and carbon dioxide reduction. In the last of the above subjects, members of the Chemistry Department have recently initiated advanced research on efficient and cost-effective direct conversion of solar energy into liquid fuels by photoelectrolytic and photocatalytic water splitting and carbon dioxide reduction. In this regard, the R&D effort is focused on the development of novel nanostructures. As catalysts, such nanomaterials could improve product selectivity, thereby reducing chemical waste and producing cleaner fuels. As energy conversion materials, they could lower the final cost of liquid fuel to the end user.

**The Blechner Center for Industrial Catalysis and Process Development** has been working for some time on novel processes and catalysts to produce drop-in renewable jet and diesel fuels from a variety of vegetable and animal oils. It is expected that the process developed in this R&D effort will be commercialized in the very near future. In addition, researchers at the Blechner Center have adopted a sophisticated approach for converting hydrogen obtained from water and carbon dioxide into high-performance liquid fuels that exceed current standards set for fossil liquid fuels. The technology, which is based on novel specially tailored catalysts and catalytic processes, yields a green feed containing hydrocarbons that can readily be converted into high-quality gasoline, jet and diesel fuels by well-established, commercially available technologies.

**Fuel cells research** at BGU focuses on a number of technologies. Among these is the preparation of catalytic tailor-made porous aerogel carbon electrodes. The catalyst in these electrodes is based on non-noble metal complexes instead of the commonly used platinum, which is very expensive. Research is also being conducted on the use of similar electrode systems in conjunction with transparent organic hydrogels (used as quasi-solid electrolytes) in photoelectrochemical cells for the production of hydrogen. In addition, research is being conducted on biofuel cells; these studies are

aimed at controlling the electrochemistry of microorganisms by exploiting molecular biology to improve the electrode-living cell interaction.

**The Desert Architecture and Urban Planning Unit** has been working for decades on bio-climatic, energy-conserving, green design and planning. The guiding principle of the Unit's research effort is that intelligent, sustainable design can significantly reduce a building's energy use over its full life cycle, thereby minimizing the ecological footprint, while providing a thermally, visually, acoustically and functionally comfortable and healthy indoor environment.

**Thermoelectrics** research is conducted in the Department of Materials Engineering. As a direct energy conversion method between heat and electricity, thermoelectrics is used mainly for electrical power generation and cooling applications. To meet the need for highly efficient novel thermoelectric materials, the BGU research group has developed a variety of materials with suitable properties, including class IV-VI compounds (e.g., PbTe and GeTe), half-Heusler alloys (e.g., TiNiSn) and silicides (e.g., higher manganese silicides).

**Energy policy** is addressed by two groups at BGU. The Sustainability and Environmental Policy research group studies a wide range of linkages between society, energy and the environment. The research focuses on exploring energy consumption patterns at the urban, national and international scales and on analyzing its implications for sustainable policy and planning. The Department of Policy and Administration Research conducts research on economic modeling of energy markets, management of natural resources, and the economics and environmental aspects of renewable energy.

## Research Horizons

BGU will continue to strive to strengthen its national and international profile as a globally renowned institution in R&D on renewable and alternative energy by promoting advanced fundamental research and searching for potential applications through the recruitment of excellent researchers in the relevant fields, increased R&D budgets, enhanced national and international cooperation, and an improved research infrastructure.


*Prof. Moti Herskowitz*

Prof. Moti Herskowitz is a professor of chemical engineering and a researcher in the fields of advanced materials, heterogeneous catalysis, and renewable fuels. In 1995, he established and became the director of the Blechner Center for Industrial Catalysis and Process Development, leading many of its research programs. He has published over 130 papers and 22 patents based on both basic and applied research. Some of the patents deal with novel renewable and clean fuels and the processes for their production, while others are related to environmental catalysis and green chemistry.

In the framework of the Blechner Center, Herskowitz has been involved in a number of projects related to alternative and renewable fuels. Of special note is the recent announcement by ExxonMobil that the company will partner the Blechner Center in the development of a breakthrough technology that will facilitate the on-board generation of hydrogen, thus advancing the application of fuel cells for transportation. Another patented technology developed at the Blechner Center is the production of advanced, green diesel fuel from vegetable and animal oil, ready for commercialization. Herskowitz is currently engaged in the development of liquid fuels production from carbon dioxide and hydrogen, as was described at the recent Bloomberg Fuel Choices Summit in Tel Aviv.

Prof. Taleb Mokari of the Department of Chemistry and the Ilse Katz Institute for Nanoscale Science and Technology focuses on the development of a new class of hybrid nanomaterials for optical, electrical and energy-related applications. His group specializes in synthesizing nanostructures, investigating their fundamental physical and chemical properties, and studying their potential applications within the realm of renewable energy. Specific research topics of the Mokari group include the development of novel approaches to synthesize nanostructures and to control their shape and composition; the synthesis of metal, metal-oxide and semiconductor nanoparticles; and the synthesis and assembly of multi-component nanostructures. Mokari also studies the impact of nanomaterials on the environment. Among Mokari's awards and achievements are the Fulbright Fellowship for Postdoctoral Studies (2006/7), the IUPAC Prize for Young Chemists (2006), the Ilan Ramon Fellowship for the Best Fulbright Fellow (2007), and the Krill Award (2011). Recently, he was awarded the prestigious ERC Starting Grant. He is a member of the Israel Solar Fuels Consortium – comprised of researchers from BGU, the Technion-Israel Institute for Technology and the Weizmann Institute of Science – that was awarded a grant by the Israel Science Foundation (ISF) to establish an Israeli Center of Research Excellence (I-CORE).


*Prof. Taleb Mokari*

# Robotics Research at BGU

## Prof. Yael Edan, Coordinator

After a decade of basic and applied research on different aspects of robotics technologies, such as perception, motor control, mechanical design, intelligent systems and human-robot interactions, BGU has become a leader in the field, with advanced research being conducted in several laboratories across campus, as detailed below

### Computational Computer Vision

No robot can be made 'intelligent' without the ability to sense the environment. Much of the sensing research at BGU is focused on computational and computer vision. This research has two goals—the development of algorithms that automatically analyze real-world visual information (images and videos) for practical tasks and the computational modeling of biological and human visual capacities with the aim to understand how visual perception occurs in the brain.

### Computational Motor Control

Research at BGU on computational motor control seeks to understand how the brain controls movement and hence covers physiological, behavioral, and theoretical modeling associated with motor control, motor learning and motor adaptation, and physiological studies of the cerebellum and cerebellar processing. State-of-the-art robotic devices are used to generate an augmented reality environment with haptic feedback such that people can interact with virtual objects and "feel" them with both hands. The applications of these studies include robotics telesurgery, rehabilitation of the physically disabled, and the development of human-like robots and novel human-machine interfaces. Today, BGU researchers are internationally recognized for their work on time representation, the perception of delayed stiffness, the Turing-like handshake test for motor intelligence, and intelligent grasping methodologies.

### Biomechanics

Extensive research at BGU has focused on the interaction between human movement and robotics. Theory and experimental work are integrated in the development of two types of robot: legged robots (including various approaches for locomotion, development of motion algorithms, and combining sensor information and control) and wearable robots (exploiting human movement for energy harvesting and using an exoskeleton to study how muscle and tendon work is related to metabolic cost).

### Biomimetic Robots

The production of biomimetic robots is based on adapting designs from nature to solve modern problems. Among the robots that have been designed and built in BGU's Mechanical Engineering Robotics Laboratory are those that climb like spiders, crawl like snakes, or walk on four legs like horses. The laboratory also produces robots that mimic human actions, such as opening and closing a valve. All stages of production of unique robot prototypes are covered—from the mechanical design, through the electronics and software (including motion planning algorithms), to the control systems.

### Integrated Manufacturing Technology

The newest of the robotics laboratories at BGU comprises a digital factory facility that embodies the central tenets of industrial engineering and management—production planning, intelligent automation, information systems, and human factors. The facility, which supports both research and teaching, is designed for the production of 3D puzzles in fully automated, semi-automated, and manual stations. The process is supported by a heterogeneous IT infrastructure, which includes manufacturing databases, shop-floor control, data warehousing, business intelligence, and enterprise systems.

### Human-Robot Interaction

R&D across the campus on advanced human-robot interaction includes construction of physical and virtual environments, measurement of operator performance, advanced interaction

modules (gestures, voice, virtual reality, human tracking, force control), and methods for the design of optimal human-robot collaboration models and interfaces. Applications focus on service and agricultural robotics and are exploited in the Telekom Innovation Laboratories @ Ben-Gurion University and in medical applications.

## Agricultural Robots

By developing sophisticated intelligent algorithms, BGU's leading agrobot group composed of researchers from the Departments of Industrial Engineering and Management, Computer Sciences and Mechanical Engineering work closely together in R&D on agricultural robots. To date, successful developments include robotic technologies for spraying date palm trees, grape vines and greenhouse-grown peppers. In addition, BGU researchers are developing intelligent algorithms for sensing, grasping and spraying of high-value crops as part of the cRops Project (clever robots for crops), which is focused on developing modular systems for intelligent robotic sprayers and harvesters.

## Research Horizons

To advance innovative multidisciplinary robotics research, BGU has recently established the Agricultural, Biological, and Cognitive (ABC) Robotics Center, with a generous donation from the Leona M. and Harry B. Helmsley Charitable Trust Fund. The aim is to establish a research center focused on a commitment for collaboration and interdisciplinary, application-oriented research and on the development of robotic systems in established areas of excellence, including medical, service, industrial and agricultural robotics. The initiative will facilitate interactions between faculty members from such a variety of disciplines as education, psychology, physiology, and neurosciences with 'traditional' robotics researchers from BGU's Departments of Industrial Engineering and Management, Mechanical Engineering, Computer Science, Biomedical Engineering, and Electrical and Computer Engineering. In such a framework, innovative ideas and new directions will be maximized in both top-down and bottom-up projects. The initiative will serve to leverage BGU research to produce scientific breakthroughs in robotics, to attract competitive funding, and to pave the way for BGU to become established as an internationally recognized powerhouse in agricultural, biological, and cognitive robotics research.


*Prof. Yael Edan*

## Prof. Yael Edan

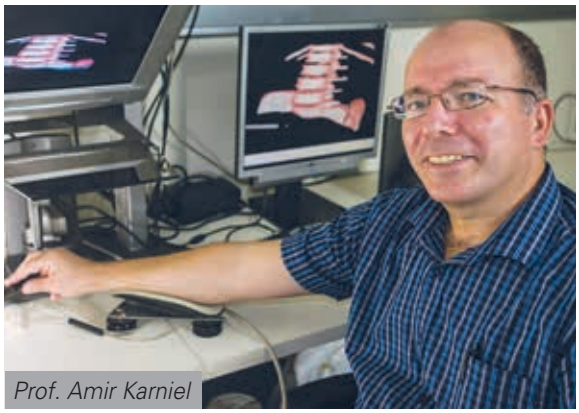
of the Department of Industrial Engineering and Management leads a team of researchers and graduate students conducting robotics research. Their research effort includes robotic performance analysis, systems engineering of robotic systems, sensor selection and fusion, multi-robot control methodologies, and human-robot collaboration methods. Edan has made major contributions in the introduction and application of intelligent automation and robotic systems to the field of agriculture, with several patents to her credit. She has been involved in and has led many international projects (with colleagues in the USA, Japan, and Europe). She is currently active in the development of robotics harvesters, interactive robots, and an intelligent selective sprayer.

At BGU, Edan has served in several management functions including Deputy Rector, Chair of the Department of Industrial Engineering and Management, and Chair of the Paul Ivanier Center for Robotics and Production Management. She is the initiator – and is currently leading – the ABC Robotics Initiative.

Edan has published over 60 articles in peer-reviewed journals. Her work has been recognized by the awarding of several prizes by leading conferences and journals. She has served on and has led many international and national advisory and review committees and conference and journal committees. She has guided over 50 graduate students, many of whom are currently in leading positions in industry and academia.

## Prof. Amir Karniel, Head of the

Computational Motor Control Laboratory, is also Head of the Department of Biomedical Engineering, a member of the Zlotowski Center for Neuroscience and a member of the Steering Committee for the new Agricultural, Biological, and Cognitive (ABC) Robotics Center. His research interests thus lie at the intersection of these fields of endeavor and include haptics, motor control, motor learning, human machine interaction, and brain theory. Karniel's research has been published in leading peer-reviewed journals, including the Journal of Neuroscience, the Journal of Neurophysiology, Advanced Robotics, and IEEE Transactions and Computational Neuroscience. He is a senior member of the IEEE and serves on the editorial boards of a number of journals, such as IEEE Transactions on Human Machine Systems. He is a member of two European Research network groups, the COST Action on Robotics for NeuroRehabilitation and the Delta-g ESA Topical Team studying motor control in uncertain dynamics. In 2012, Karniel received the Juludan Prize from the Technion-Israel Institute for Technology for his research on transparency in teleoperation. The research of Karniel and his group in the computational motor control laboratory is funded by competitive funding agencies, including the Israel Science Foundation (ISF), the United States-Israel Binational Science Foundation (BSF), and USAID-MERC.


*Prof. Amir Karniel*

# The Research & Development Authority

## Sharona Rittberg, Director

*http://in.bgu.ac.il/en/osr/Pages/default.aspx*

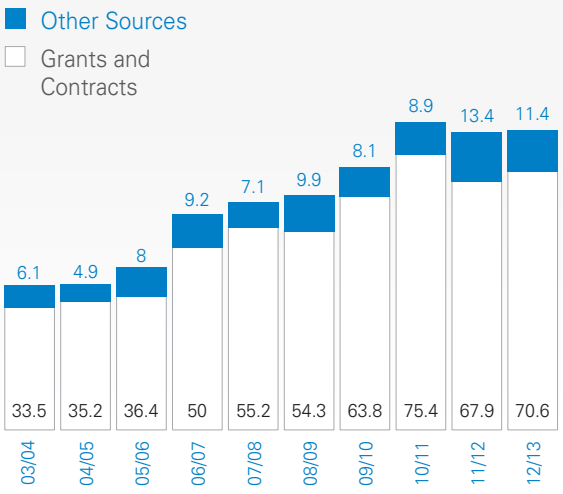

*Sharona Rittberg*

The Research & Development Authority (RDA) is the central entity at BGU that oversees funding for research. In addition to managing the entire process for grant applications submitted through its offices, the RDA is also responsible for the administrative aspects of other research-related activities, such as projects supported by BGN Technologies, research funded by donations, internal grants awarded by BGU's research centers, and externally funded research scholarships.

Starting with the organizational changes of 2000, the RDA has professionalized its activities to meet the demands of the competitive and ever-changing world of research funding. Over the past decade, there has been a growing realization that professional support involves both technical assistance to researchers and attention to the quality of the applications. Several steps have been taken, the first being the appointment of an internal supervising accountant to structure the management of research budgets in compliance with the regulations of the relevant foundations, national legislation, and institutional procedures. The second step was the incorporation into the RDA of the University's Scientific Publications Section. The mission of this unit is to give new researchers the utmost possible help to start their careers as independent researchers, with their applications being edited and tailored to the formal and conceptual requirements of the particular funding agencies. Where necessary, newcomers are 'matched' with successful senior researchers, who aid them in preparing high-quality applications. The RDA's efforts to support early career scientists thus mesh with the University's mentoring program – started a few years ago – that will hopefully become mandatory in all the faculties in the near future. The Scientific Publications Section also edits institutional applications and applications of more senior faculty to prestigious funding bodies. To increase funding from the Israel Science Foundation (ISF), the largest and most significant source of funding for basic research in Israel, the Section runs a workshop for writing ISF grant applications, which attracts large audiences of both new and more established researchers. In parallel, in its overall effort to upgrade the quality of proposals of BGU faculty to prestigious funding agencies, the RDA is in the process of making the information on the grant activities of each researcher in its database transparent and accessible to that researcher. The RDA also promotes the services of the statistician recently hired by the University to aid researchers with planning their studies and with analysis of their data.

One of the main priorities of the RDA is to aid researchers to participate in the programs of the European Union (EU). Although BGU has been participating in these programs for more than 17 years, the RDA has always been well aware that researchers regard these programs as complicated, time consuming, problematic in

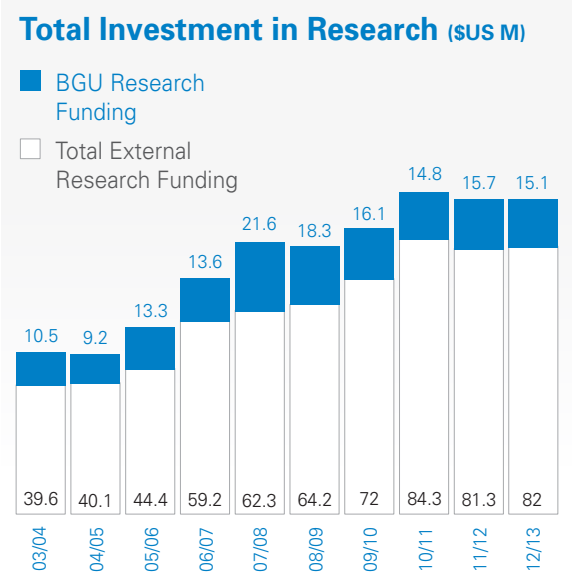
**Total External Research Funding ($US M)**



terms of joining consortia, and demanding with regard to formal handling. In working with external consultants, the RDA came to the conclusion some years ago that the University requires intensive and readily available in-house consulting. A very experienced consultant in EU programs was thus recruited, and she immediately started to actively reach out to researchers to develop projects that are compatible with the various EU funding programs. Although BGU's success rate in EU projects has still not reached the desired level, there has been a significant increase both in participation and in the number of funded projects. The assistance given to researchers applying for the most prestigious EU program – the ERC – brought in 11 grants that received excellent reviews and specific remarks about the improving quality of the BGU research infrastructure. Success in obtaining these ERC and other EU grants has positioned BGU firmly as a research university — a far cry from the small young institute that it was at the beginning of the last decade. The RDA is currently gearing up for the next challenge—to aid BGU researchers to participate in Horizon 2020, the new seven-year program of the EU and the most significant funding source at present.

Notifications of awards from granting agencies is the first step in the second aspect of the RDA's activities—project management, which includes grant negotiations, ensuring certified compliance with ethical standards, opening of budget accounts in the University's financial system, and monitoring grant expenses according to the requirements of specific contracts.

The extensive list of internal office procedures drawn by the RDA's supervising accountant has established the foundation for high standards of financial management and compliance with the demands of both the foundations and of University and national regulations. These high standards that the RDA are reflected in the satisfactory audits of external auditors and in the completion of projects




without deficits. The RDA insists on training researchers in managing complex projects. To this end, it holds general training sessions and individual briefings aimed to show principal investigators and their assistants the best and most effective way to manage grants. However, the RDA has found that researchers also need a closer support system within their faculties, and a new research support position has been set up in each faculty. The research support personnel are trained by the RDA and together with the RDA personnel constitute an ongoing forum that deals with common problems and procedures.

With an eye to the future, the RDA believes that researchers who are fruitful and active should focus on conducting research and therefore strives to make their administrative burdens as light as possible. Thus, in addition to the support and training described above, the RDA will continue to maintain a dialogue with the staff that handles the day-to-day research to hear their views and difficulties. RDA personnel will also continue to meet with other administrative units in the University with the aim to minimize problematic interfaces and reduce response times.

# BGN Technologies
## Bridging academia and industry
### Netta Cohen, CEO

*http://cmsprod.bgu.ac.il/eng/BGN1*


*Netta Cohen, CEO*

### Link between Academic Research and Industrial Advancement

BGN Technologies, BGU's technology transfer company, is responsible for the commercialization of the know-how and innovative technologies created by the University. By creating opportunities for partnering researchers with industry and investors, BGN contributes to the market value of these technologies. The activities of the Company are thus focused on seeking prospective strategic partners, licensees and investors for the commercialization of BGU inventions and know-how. It offers various tailor-made cooperation models to enterprises of every size—from multinationals to start-ups. BGN is also responsible for filing patent applications worldwide and managing the University's patents and IP portfolio. The company promotes technology transfer to the marketplace on a number of ways, as described below.

### Technology Transfer to the Marketplace

**Technology licensing** - BGN licenses technologies developed at BGU and enters into R&D agreements with companies worldwide. BGN has signed hundreds of license and collaboration agreements, including agreements with multinationals, such as Bayer, Hutchison Water, Applied Materials, EMC, Syngenta, Deutsche Telekom, France Telecom, GM, IBM, and J&J. In parallel, the Company also facilitates cooperation with Israeli companies. By keeping close contact and on-going communication with business partners in Israel and worldwide, BGN Technologies is able to promote research collaborations, technology transfer, and joint ventures.

**Collaborative research with industry** - BGN negotiates and signs research agreements with companies on the basis of BGU's expertise and facilities and represents the University in a number of consortia established between industry and academia for the development of generic know-how.

**Start-up companies** - BGU inventions are new platform technologies and therefore have start-up potential. BGN has established over 30 new spin-offs over the past ten years.

**Research centers and regional economic development** - In addition to its classic technology transfer activities, BGN is involved in projects related to the economic development of the Negev, such as Bio-Negev (an umbrella organization that promotes bio-related activities in the region), DT Innovation Lab at BGU (joint high-tech research laboratories of Deutsche Telekom and Ben-Gurion University), Capital Nature (operating the Israeli National Renewable Energy Center in the Arava) and CyberLabs (a partnership of BGN with Israel's most successful venture capital firm, JVP, to open the first cyber incubator in Israel). BGN also assists the city and the University to attract companies to the Advanced Technologies Park that is being built adjacent to the University (as described in this booklet).

### A decade of growth

The growth of BGN Technologies in the past ten years is impressive, with hundreds of licensing agreements now in place. In addition, in comparison with ten years ago, the patent portfolio is eight times larger, the dollar value of yearly sponsored research is four times higher, and the dollar value of royalties is ten times higher. With such achievements, the company is indeed headed for a promising future.

Prof. Amir Sagi, incumbent of the Lily and Sidney Oelbaum Chair in Applied Biochemistry, is a former Dean of the Faculty of Natural Sciences and a member of the Department of Life Sciences and of the National Institute for Biotechnology in the Negev (NIBN). Sagi and his group conduct basic and applied research on genes and gene products related to processes of sexual differentiation and skeletal bio-mineralization in crustaceans (particularly, prawns, crayfish and shrimps). The applied research has led to the elaboration of a novel biotechnology for the production of all male populations of the giant freshwater prawn through temporal RNA interference. For this work he received the Global Aquaculture Alliance's inaugural Novus Global Aquaculture Innovation Award. The process was patented through BGN Technologies and licensed to the Israeli Tiran Group, which signed an agreement with Vietnamese company Green Advances to implement the system in their farms in Vietnam. Sagi is also the co-founder of two start-ups based on his research, Amorphical Ltd and Enzootic Ltd. Sagi has a global reputation, being invited to give

*Prof. Amir Sagi*

presentations and plenary lectures at international conferences and serving as President of the International Society for Invertebrate Reproduction and Development (ISIRD). He has over 120 publications to his credit, and he has received funding from such prestigious foundations as the United States-Israel Binational Agricultural Research and Development (BARD), USAID-CDR, the Israel Science Foundation (ISF), the German-Israeli Foundation (GIF), and the EU FP6 and FP7 Programmes.

# Selected projects

- BL-1040 for treating heart attacks licensed to BioLine RX and Ikaria Holdings Inc
- Bayer BioScience and BGU to collaborate on developing solutions for plant heat and water stress
- ExxonMobil partnered with BGU, QuestAir Technologies and Plug Power Inc to commercialize an on-vehicle hydrogen production system
- Physicians at Cincinnati Children's Hospital Medical Center to collaborate with BGU engineers to develop pediatric-specific medical technologies
- CartiHeal Ltd founded to develop BGU know-how on cartilage implants
- Multiphy Ltd founded to develop BGU know-how on high speed fiber optics
- Elminda Ltd founded to develop BGU know-how on neuroscience (management of brain disorders and injuries)
- BGU to assist France Telecom to improve its Internet communications
- Research centers of EMC and RSA opened at the Advanced Technologies Park in collaboration with BGU
- Aroma, a new production facility of Makhteshim-Agan, established as a result of research cooperation with BGU

The ATP was inaugurated in September 2013 by Prime Minister Benjamin Netanyahu. The first building is already occupied by multinational corporations, and construction is well underway on the second building.

# Advanced Technologies Park

The Advanced Technologies Park (ATP) was established as a public-private partnership between BGU, the Beer-Sheva Municipality, KUD International LLC, and GAV-YAM Negev. This world-class venue is designed to accommodate advanced research and development for the global hi-tech and life science industries. The ATP is located on 93,000 square meters of land, with over 200,000 square meters of high-standard "class A" office and laboratory space planned in an anticipated 16 buildings. All the buildings will be LEED (Leadership in Energy & Environmental Design) certified for environmentally sustainable "green" construction.

The ATP is strategically located adjacent to BGU, to the new IT & Technology Campus of the Israel Defense Forces (IDF), and to the Soroka University Medical Center. This close proximity is already stimulating synergistic cooperation between these three leading R&D institutes: The research prowess of BGU in the sciences and technologies has been amply illustrated in this booklet; the IDF technology units are known to be the single biggest source of the talented, innovative and creative workforce that drives Israel's hi-tech industry; and the campus of the Soroka University Medical Center is home to BGU's Faculty of Health Sciences, whose research directions in medicine-related subjects are also described herein.

The Park houses start-ups, incubators (e.g., JVP Cyber Incubator and Elbit HS Incubator), small- to medium-size companies, multinationals (e.g., EMC, Oracle, Allscripts (dbMotion), Ness Technologies, Dalet, and Verint), Telekom Innovation Laboratories @ BGU, and BGN Technologies. Many of these companies are already leveraging BGU's research strengths, focusing on areas such as cyber security, data storage, and information management.

Added advantages of the site are its easy accessibility from the Beer-Sheva North train station and the new 150-200 room Hotel and the Conference Center that is being developed adjacent to the ATP.

# Ten Years of Leadership in R&D

The transformation of BGU from a small provincial university to one that is recognized in the arena of cutting-edge research would not have been possible without the strong academic leadership and vision of the deans and other key research functionaries and their support staff at BGU.

**President**
Prof. Rivka Carmi - present
Prof. Avishay Braverman

**Rector**
Prof. Zvi HaCohen - present
Prof. Jimmy Weinblatt

**Deputy Rector**
Prof. Steve Rosen - present
Prof. Avishay Goldberg - present
Prof. Yael Edan
Prof. Lily Neumann
The late Prof. Shraga Segal

**Vice-President and Dean for Research and Development**
Prof. Moti Herskowitz

**Deputy Vice-President and Dean for Research and Development**
Prof. Dan Blumberg - present
Prof. Arie Moran

**Vice-President and Director-General**
Mr. David Bareket

**Vice-President for External Affairs**
Prof. Amos Drory

**Dean of the Faculty of Health Sciences**
Prof. Gabriel Schreiber - present
Prof. Shaul Sofer
Prof. Rivka Carmi

**Dean of the Faculty of Natural Sciences**
Prof. Shlomi Dolev - present
Prof. Amir Sagi
Prof. Abraham Parola

**Dean of the Faculty of Engineering Sciences**
Prof. Joseph Kost - present
Prof. Gabi Ben-Dor
Prof. Yigal Ronen

**Dean of the Pinchas Sapir Faculty of Humanities and Social Sciences**
Prof. David Newman - present
Prof. Moshe Justman
Prof. Avishai Henik

**Dean of the Guilford Glazer Faculty of Business and Management**
Prof. Oded Lowengart - present
The late Prof. Ayala M. Pines
Prof. Arie Reichel

**Director of the Jacob Blaustein Institutes for Desert Research**
Prof. Pedro Berliner – present
Prof. Avigad Vonshak

**Dean of the Kreitman School of Advanced Graduate Studies**
Prof. Michal Shapira – present
Prof. Ramy Brustein
Prof. Zvi Priel

**Dean of the Eilat Campus**
Prof. Miriam Amit – present
Prof. Shaul Krakover
Prof. Amos Drory

**Director of the Ben-Gurion Research Institute for the Study of Israel and Zionism**
Dr Paula Kabalo – present
Prof. Avigad Vonshak
Prof. Yehuda Gradus

**Dean of Students**
Prof. Moshe Kaspi

**Director of the Ilse Katz Institute for Nanoscale Science and Technology**
Prof. Yuval Golan – present
Prof. Moshe Gottlieb

**Director of the National Institute for Biotechnology in the Negev**
Prof. Varda Shoshan-Barmatz

**Office holders of the Research & Development Authority**
Ms Sharona Rittberg - Director
Ms Sharon Ohayon Dromi - Supervising Accountant
Ms Jenny Racah - Advisor to the VP and Dean for R&D
Ms Inez Mureinik - Head, Scientific Publications Section

**Ben-Gurion University of the Negev**, established in 1969 with the aim to bring development to the Negev, has been shaped in many ways by its unique desert location. From the very beginning, its small size, warm atmosphere, and pioneering spirit encouraged unexpected interdisciplinary collaborations. In retrospect, what started through necessity, and a shortage of resources, has positioned BGU at the forefront of a number of developing scientific and scholarly fields. Today, BGU is a globally recognized research university, conducting frontier research in its six faculties—Engineering Sciences, Health Sciences, Natural Sciences, the Pinchas Sapir Faculty of Humanities and Social Sciences, the Jacob Blaustein Institutes for Desert Research and the Guilford Glazer Faculty of Business and Management. The establishment of new research institutes, centers and laboratories, along with the upgrading of existing research units, has made a major contribution to interdisciplinary research. The emphasis on applied research – adopted by BGU from the very beginning – has been intensified by exploiting advanced fundamental research to advance the so-called use-inspired research.

For more information contact the Office of the Vice President
& Dean for Research and Development: avakrat@bgu.ac.il

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