ARIEL UNIVERSITY

SPOTLIGHT ON INNOVATIVE RESEARCH



FACULTY OF ENGINEERING



SCHOOL OF HEALTH SCIENCES

SCHOOL OF ARCHITECTURE



FACULTY OF SOCIAL SCIENCES & HUMANITIES





FACULTY OF NATURAL SCIENCES



INTERDISCIPLINARY RESEARCH CENTERS

THE EASTERN R & D CENTER



THE MOSKOWITZ SCHOOL OF COMMUNICATION



SPOTLIGHT ON
INNOVATIVE RESEARCH



ARIEL UNIVERSITY: A NEW SPIRIT OF ACADEMIC ACHIEVEMENT IN THE HEART OF THE LAND OF ISRAEL

We are proud to present herewith some of the remarkable research endeavors underway at Ariel University.

Tracing its beginnings back to 1982 as the College of Judea and Samaria, and known later as Ariel University Center, Israel's newest university, Ariel University, is evolving into a major institution of research and higher education and taking its place among the ranks of Israel's most honored and respected universities.

Full research university status was granted in December 2012, making it Israel's 8th research university – the first research university to open in Israel in 40 years. Today, Ariel University is Israel's fastest growing institution of higher education, with over 17,000 students and over 500 senior faculty, representing the full spectrum of Israeli society.

AU's faculties include:

- Natural Sciences
- Engineering
- Social Sciences and Humanities
- School of Health Sciences
- School of Architecture
- Moskowitz School of Communications

The Dr. Miriam and Sheldon G. Adelson Medical School at Ariel University, Israel's 6th medical school, was accredited by the Council of Higher Education, and is due to open in 2019.

AU is home to several interdisciplinary research centers:

- Integrative Brain Science Center
- Cancer Research Center
- Center for robotics research and applications
- Schlesinger Center for Compact Accelerators
- Zimin Materials Research Center
- The Eastern R & D Center
- Center for Middle East research
- Institute for Translational Medicine

Ariel University is investing great effort in drawing excellent new faculty, along with graduate and post-doctoral students.

Coupled with its academic endeavors, Ariel University is dedicated to Zionist and democratic ideals. In keeping with Ariel University›s desire and commitment to incorporate awareness and knowledge of Jewish heritage, the Jewish people, the Land of Israel, its history and its relevance for the future, students take courses in the field of Jewish heritage.

It would be our pleasure to provide further information about the research projects featured in this pamphlet, and many the others underway at AU.

The Office of Resource development & External Affairs

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There are five departments in the Faculty of Engineering. It is the largest engineering school in Israel. Its research includes advanced work in areas such as homeland security and defense, second largest biomedical engineering, robotics and applied materials research.

IMPROVING FOOD PRODUCTION

Prof. Edward Bormashenko
Chemical Engineering

The expanding world population, increased prevalence of genetically modified crops, biofuels and animal feed, and the



growing food demand in developing countries are all major factors driving the growth of the seed market, which is expected to reach $94.5 billion in 2022, with a compound annual growth rate (CAGR) of 8.5%.

Prof. Bormashenko's lab has developed a novel technology to increase the speed of seed germination and ripening for a wide variety of crops, including peppers, tomatoes and alfalfa. This method does not affect seed DNA and is especially effective in drought conditions. The group is now developing similar methods for grains, such as wheat, rye and rice.





THE GYROTRON RESEARCH GROUP

Prof. Moshe Einat
Electrical and Electronic Engineering

Gyrotrons are high power energy sources that generate millimeter-wave electromagnetic waves, with applications for a wide range of industries, including medicine, communications, space and defense. Production of gyrotrons is highly specialized, and Israel is one of the few countries that has extensive experience in the field. The group at AU has developed and patented several gyrotron radiation sources with unique parameters to meet specific requirements. The team is investigating new directions for development, which include long distance wireless energy transfer, graphene, diamond and thin film growth, sterilization techniques and more.

METALLURGY AND APPLIED NANOSCIENCE RESEARCH LAB

Dr. Konstantin Borodianskiy
Chemical Engineering



Creating materials with advanced properties is a major challenge in today's manufacturing world. By developing new methods using nano-compounds, lab engineers are constructing new metallic materials for different industrial applications.

The studies conducted in the lab are highly applicative, with a number of signed patents and collaborations with industries, such as the automotive, aerospace and biotechnology industries.

THE ELECTRO-OPTICS GROUP

Prof. Shmuel Sternklar **Prof. Erel Granot**
Electrical and Electronic Engineering

New technological breakthroughs in the fields of nano-optics, electrooptic sensors and fiber-optic communications are being developed in the Electrooptics Lab, offering new applications and capabilities that are at the cutting-edge of the medical, commercial and military market segments. These include fiber-optic sensors for homeland security and the military;



monitoring the structural health of buildings and infrastructures; developing medical, biological and chemical sensors for medical and diagnostic instruments, water and food industries; fiber-optic communication technologies to meet the growing demand for increased bandwidth and solving serious problems that arise from these data rates.

The Faculty's five departments conduct research in a wide range of areas including energy, cyber technology & data sciences, development of measuring methods and applied mathematics. Advanced medical-related research in areas such as cancer, neuroscience, personalized medicine and tissue engineering will integrate with the upcoming Dr. Miriam and Sheldon G. Adelson Medical School.



FUEL CELLS & ELECTROCHEMISTRY LABORATORIES- RENEWABLE ENERGY STORAGE AND CONVERSION

Prof. Alex Schechter

Chemical Sciences

Prof. Schechter and his team are advancing solutions for renewable energy conversion and storage. They are developing new materials and devices that utilize renewable fuels and convert them directly into electrical energy. They do so by using a patented catalyst implemented in a high energy density device, called a fuel cell, targeting electrical propulsion applications.

This approach is a cost-effective alternative to combustion engines and future hydrogen gas-based solutions. Other studies include generating hydrogen from a microbial electrochemical cell (in collaboration with Dr. Rivka Cahan) and waste water, development of oxygen selective membranes for rechargeable metal-air batteries and exploring mechano-chemical methods for low weight hydrogen storage in fuel cell systems for autonomous vehicles and drones.





DESIGNING TARGETED ANTICANCER 'COCKTAIL' DRUGS

Prof. Gary Gellerman

Chemical Sciences

Prof. Gellerman's team develops novel multifunctional platforms for programmed drug release in targeted cancer therapy. These platforms can carry various anticancer "cocktail" drugs simultaneously, and are designed to release linked drugs in a time-dependent mode.



By conjugation with a specific carrier, these platforms almost exclusively enter cancer cells rather than healthy tissue, ensuring much less toxic treatment. The applications for such programmed drug delivery systems are broad, including targeted therapies for cardiovascular diseases, pain management, central nervous system disorders and others.



FIGHTING ANTIBIOTIC RESISTANCE

Prof. Shiri Navon-Venezia

Molecular Biology

Since the introduction of antibiotics some 70 years ago, the problem of antibiotic resistance has become a worldwide crisis that threatens our ability to treat bacterial infections, and posing a challenge to modern medicine.

The team studies basic aspects of bacterial pathogens focusing on antibiotic resistant strains with high clinical importance. It works on improving antibiotic resistance diagnosis, preventing its spread, and designing novel targeted therapeutics against those pathogens.



AEROSPACE AND NANO SATELLITE LAB

Prof. Boaz Ben-Moshe

Computer Sciences

Current satellite communications technology is extremely costly, and the economic risk of operating them can be undertaken only by big industries. Prof. Ben-Moshe and his team are developing a new concept for satellite communications, involving multiple nano-satellites that operate in swarms that simplify communications and reduce costs. These nano satellites, based on laser channels, can handle multiple operations, opening new frontiers of satellite communication.

PREDICTING NATURAL DISASTERS

Dr. Yuval Reuveni

Physics; Regional East R&D Center

Researchers at the remote sensing laboratory study tropospheric and ionospheric patterns and their link to geomorphological, meteorological and electrical changes that result in natural hazards



phenomena such as earthquakes, tsunamis, severe weather and space weather events. Understanding these patterns ahead of time helps in predicting these phenomena, offering time for the population and services to prepare accordingly to avoid disasters.



The study of these natural occurrences involves a combination of data analysis and signal processing techniques applied with measurements from various remote sensing technologies, both from the ground and space, covering the entire electromagnetic spectrum. The lab works to optimize and develop new tools and technologies for a broad range of earth science applications.

Basic and clinical research in a variety of topics, such as personalized medicine and nutrition, autism, biomechanical physiotherapy, neuro-muscular interaction, hearing psychophysics, health informatics, and big data are carried out in the six departments at the School of Health Sciences, which closely collaborates with the Israeli health system. The School's two adjunct facilities, the health clinics and the Morris Family Medical Simulation Center, are heavily incorporated into the curriculum and research. The School of Health Sciences' curriculum and research are fundamental cornerstones in the Dr. Miriam and Sheldon G. Adelson Medical School at Ariel University.

NUTRIGENETICS, PERSONAL NUTRITION AND MEDICINE

**\ Prof. Ruth Birk **

Nutrition Sciences



The lab looks at the genetic variations that affect the risk of developing obesity and studies the molecular mechanistic and metabolic consequences of those genetic variations.

The lab for personal nutrition and medicine studies and applies genetic makeup with nutritional and medical treatment. Aside from obesity, the lab focuses also on digestion, athletic performance and fertility.

Obesity is defined by health organizations as the pandemic of the 21st century. The prevalence of obesity is increasing alarmingly in both developed and developing countries. Common obesity is a complex trait caused by the interaction of genes and environment. Despite the well-established fact that genetic factors explain 40–70% of inter-individual variation in common obesity, our understanding of the genetic effects is lacking.





AUDITORY PERCEPTION AND SAFETY

**\ Prof. Leah Fostick **

Communication Disorders

Researchers at the lab study an individual's ability to use auditory information from the environment at a perceptual level.



The results obtained reveal phenomena related to the way we perceive sounds, and demonstrate a perceptual basis for different conditions, such as sleep deprivation, aging and dyslexia. For each of these populations and for other populations, as well, temporal processing, speech perception and spatial hearing studies, can map existing risks and test various developments that will prevent or reduce the likelihood of their occurrence and improve their life quality.

VOCAL PRODUCTION EFFECT

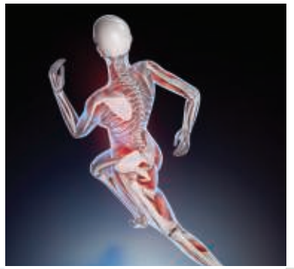
**\ Dr. Michal Icht \ Dr. Yaniv Mama **

Communication Disorders; Behavioral Science

Researchers at the Cognitive-Linguistic Lab are developing effective learning and memorization strategies for various special populations, such as



preschoolers, adults with speech disorders (e.g., dysarthria), cochlear implant users, individuals with intellectual disabilities and more. The researchers explore cognitive processes such as memory, attention and perception, and their relation to language and linguistics, aiming to link the theoretical assumptions to the clinic, offering methods to advance and integrate those populations into their environment.



Further, how the enzyme contributes to the "fight or flight" response in different types of muscles is under investigation. Whereas the study of phosphorylase and glycogen metabolism has led to the awarding of three Noble Prizes, the regulation of the enzyme in living muscle remains unclear.

MUSCULAR PHYSIOLOGY LABORATORY

**\ Prof. Abram Katz **

Physical Therapy

Using classical physiological approaches, nutritional intervention, analytical biochemistry and molecular biology, the regulation of the enzyme glycogen phosphorylase in skeletal muscle during exercise/ contractions is studied. Phosphorylase catalyzes glycogen (storage form of glucose in cells) breakdown. Specifically, studies are performed to understand how the enzyme is activated during conditions of high energy turnover and inhibited during recovery.



MUSCULOSKELETAL OVERUSE INJURIES

**\ Dr. Springer Shmuel **

Physiotherapy

Musculoskeletal overuse injuries are very common among initial military recruits. These injuries, termed as "a hidden epidemic", are extremely costly in terms of training time and military expense and have impact on military readiness.

Developing an effective way to identify soldiers who are likely to become injured may reduce this problem and increase soldier health and wellness. This study aims to investigate the predictive value of spatiotemporal gait parameters measured during loaded and strenuous walking for lower-limb overuse injuries in combat soldiers during the first year of military service. This is the first prospective study that evaluates these gait parameters while using Kinect, a low cost and available system, as an instrument for gait analysis.

The Faculty of Social Sciences and Humanities offers 16 study programs. Advanced research is conducted in the Department of Jewish Heritage on history, archaeology and culture, as well as Middle East studies, social studies and behavioral economics.

HUMAN RESPONSE TO ADVERSE EVENTS

**\ Prof. Menachem Ben-Ezra **

Social Work

Worldview is defined as how one sees, understands and interprets the world. It is anchored in the set of beliefs that we shape during a lifetime, and usually relates to philosophical, regional and political issues. There are incidents, though, that can rattle that base and put one into a phase of questioning and change. Prof. Ben-Ezra studies psychological trauma and worldview change following major incidents like the Charlie Hebdo terror attack in Paris, the 2016 hate crime in Orlando Florida and the 2017 suicide bombing at the Manchester Arena in the UK. By understanding these changes, Prof. Ben-Ezra is further establishing psychiatric diagnosis of stress syndromes, namely Adjustment Disorder, Post Traumatic Stress Disorder (PTSD) and Complex PTSD based on the ICD-11.



INTERDISCIPLINARY INSTITUTE FOR HOLOCAUST RESEARCH AND EDUCATION

**\ Prof. Nitza Davidovitch **

Education

Holocaust education in and outside of Israel has the potential to raise global-moral questions and create moral change, be it individually or as a society, by actively exploring the cognitive, emotional and moral aspects that people faced during that period. While numerous programs exist in formal education systems and research institutes worldwide, these programs fall short of effectively meeting the needs of contemporary Holocaust education, not the least due to the lack of consistency and a holistic framework for Holocaust education.

Prof. Davidovitch and her team work to infuse educational material development with international collaborated research work to conserve Holocaust memory for future generations.



ORIGINS OF HALAKHIC JUDAISM

**\ Dr. Yonatan Adler **

Land of Israel Studies and Archaeology

"Halakhah", in its broadest sense, refers to the overall system of Jewish law, especially as it relates to the details of ritual practice, and serves as a hallmark of Judaism as we know it.

The Origins of Halakhic Judaism Project seeks to recruit data from archaeology in tandem with textual evidence, with the goal of studying how ancient halakhah originated and subsequently developed over time. Archaeology and texts tend to provide very different kinds of information, and if brought together prudently, hold the potential to afford a much more comprehensive and accurate understanding of halakhah's genesis and how it was observed in the ancient past.

S.P.A.C.E. - SOLOMON PROJECT ARCHITECTURAL COMPOSITION & HERITAGE

UNIVERSITÀ DEGLI STUDI DI FIRENZE AND ARIEL UNIVERSITY - INTERNATIONAL SEMINAR



**\ Prof. Arch. David M. Cassuto **

**\ Arch.Yoram Ginzburg **

**\ Arch. Yair Varon **

The School of Architecture

S.P.A.C.E. is the result of years of dialog and international student exchange between Università degli Studi di Firenze and Ariel University. Students alternately spend a period of ten days or more in the other country, working on two architectural projects, one in Florence, and one in Jerusalem.

Students work together in collaboration, drawing on personal experience and planning methods of their home university. It enables many students to be exposed to different cultures and architectural styles, both from the historical point of view and planning methods.



INTERNSHIP & PRACTICUM PROGRAM

**\ Dr. Ilan Tamir **

The Moskowitz School of Communication



College is the time to get experience, inside the classroom and out. Internship & Practicum The program allows students to test career options and build their resumes. As part of this program, students training in commercial companies produce high quality content of television formats, websites, podcasts, films, etc.

In addition, The School of Communication Studies offers students an opportunity to work as marketing and PR assistants in AU's marketing and PR departments.



Several interdisciplinary research centers on campus serve as a nurturing environment for shared study, idea exchange and innovation.

THE SCHLESINGER FAMILY CENTER FOR COMPACT ACCELERATORS, RADIATION SOURCES AND APPLICATIONS (FEL)

**\ Director: Prof. Aharon Friedman **

The Schlesinger Center is Israel's national knowledge center for accelerator and radiation sources. It attracts scientists from all over of the country for scientific collaboration and training. The center works closely with the Israeli Ministry of Defense and collaborates with similar institutions worldwide.

The center is home to three accelerators that cover a wide range of applications, from cancer treatment and medical research to development of security technologies and more. The latest accelerator added to the center, designed together with UCLA and INFN, is unique in the world both for its compact design and for its high charge (current) yield.



ARIEL CYBER INNOVATION CENTER (ACIC)

**\ Directors: Dr. Eran Omri and Dr. Amit Dvir **

ACIC is a hub for theoretical and applied research, and teaches advanced cyber studies, initiating cooperation with government agencies, businesses and the public sector through scientific cooperation with academic and research institutes. It provides training based on real cyber-attack simulations in Israel and abroad, giving hands-on training in which participants encounter advanced attack scenarios in a realistic and secure environment, with the guidance of the center's experts.

ARIEL INTEGRATIVE BRAIN SCIENCE CENTER (IBSCA)

**\ Director: Dr. Izhak Michaelevski **

IBSCA applies scientific research to healthcare and industry to promote the development of new technologies for improving well-being and longevity.



Inspired by a true spirit of collaboration, IBSCA integrates around 20 research groups dealing with a wide spectrum of approaches, from molecular, behavioral and functional, to clinical, computational and pure mathematical methodologies.

The center focuses on how the brain fundamentally functions, in an effort to understand the mechanisms that lead to deterioration brought on by devastating diseases, such as Alzheimer's, Parkinson's and other neurodegenerative diseases, to seek ways of prevention and treatment, and to adapt appropriate environments for those suffering from these ailments.

INTERDISCIPLINARY
RESEARCH CENTERS



ARIEL CENTER FOR APPLIED CANCER RESEARCH (ACACR)

**\ Director: Prof. Michael Firer **

At ACACR, researchers from a wide spectrum of disciplines are applying their expertise to spearhead an innovative interdisciplinary battle against cancer that crosses yesterday's traditional biomedical boundaries, leading to applied practical applications using cutting-edge technology and science. The center collaborates with experts from other Israeli universities, research centers, hospitals and industry, focusing on revolutionary new trends for prevention, diagnosis and treatment of cancer aimed at treating afflicted individuals more effectively and with fewer side effects, with special emphasis on the psychosocial effects of cancer on patients and families.

THE FIELD CENTER FOR ENTREPRENEURSHIP (FCE)

**\ Director: Dr. Eleonora Shkolnik **

FCE is a regional hub for teaching and developing entrepreneurial skills, promoting business excellence and international networking through collaboration between academia, the local municipality and the private sector. The international FCE Mentors Club (FMC) brings together leading professionals from academia and industry to guide participants throughout the growth of their start-ups from idea through eventual business. Through FCE international cooperation with American, Canadian, and other universities and business schools abroad, FCE offers participants intensive summer courses, exchange programs and business development opportunities.



THE MIDDLE EAST & CENTRAL ASIA RESEARCH CENTER

**\ Director: Dr. Ronen A. Cohen **

The center provides a unique forum for interdisciplinary research from fields of social sciences, international relations and humanities relating to Middle East (ME) issues.





The goal of the center is to advance knowledge of significant past and present movements and forces working in the region. These insights are critical in decision-making in today's world where the Middle East plays a global role. The center's online publication, The Journal for Interdisciplinary Middle Eastern Studies (JIMES), and is published regularly with contributions from scholars from Israel and overseas.



THE INSTITUTE OF ARCHAEOLOGY

Director: Prof. Itzhaq Shai

The Institute of Archaeology at Ariel University is the newest archaeology institute in Israel. It was established in 2015 with the vision of bringing new approaches to archaeological research in the region.

The Institute views archaeology as an integral part of humanity's cultural heritage which can and should serve as a link between the academy, the public and our common past. With this in mind, the Institute develops programs dedicated to "community archaeology", integrating both local schools as well as volunteers from Israel and abroad, of all ages and from all walks of life.

THE CONRAD AND RUTH MORRIS MEDICAL SIMULATION CENTER



The Simulation Center at the Ariel University was established to afford a practical learning experience.
The center simulates environments and real events from a variety of fields, enabling practice and improvement of professional and interpersonal skills, with modules that can be geared to a wide audience of students, professionals and organizations alike.



The center can be adapted to doctors and other medical professionals, teachers, sales and marketing personnel, job seekers, human resources coordinators, psychologists, and more.
The center includes 7 spacious simulation rooms with a capacity of up to 100 people.

The Regional East R&D Center, directed by Prof. Miriam Billig, is an independent state research center located at and working in close collaboration with Ariel University. Its main interests are the interrelation of environmental, agricultural, and social issues in the region and around the globe. The center also serves as a forum for regional joint dialogue and cooperation between the Jewish and Palestinian populations of the area.

THE SAMSON FAMILY WINE RESEARCH CENTER

Director: Dr. Elyashiv Drori



Research focuses on the development and application of new methods for grapevine DNA analysis, application of next generation sequencing (NGS) tools for genomic characterization of grape traits and the development of robotic and sensor techniques to improve wine quality and production methods.
The most advanced genomic and technological knowledge in wine research is used in the laboratory.

The lab is also engaged in a unique study that is tracing lost ancient varieties of wine grapes that were used for wine production in ancient times. Remains of these indigenous grapes were discovered in archaeological sites around Israel. This research is leading to the revival of the wines produced during Biblical times – the wines served on the table of King David.

ENVIRONMENTAL RESEARCH CENTER

Director: Dr. Yaakov Anker

The center focuses on restoring and preserving the regional environment while maintaining its delicate life structure.



Research involves the use of applied scientific research include vast range of topics linked to environmental issues, such as:

- Hydrology for urban and rural runoff management
- Groundwater resource development and management
- Transboundary water resource and air pollution management
- Environmental pollution
- Solid waste management
- Biological Integrative Pollution Prevention and Control (Bio-IPPC) systems
- Renewable Energy for production of aquatic biomass and its transformation into transportation fuels by algae and water plants in wastewater treatment processes

ARIEL UNIVERSITY, ISRAEL

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