THE NATIONAL INSTITUTE FOR BIOTECHNOLOGY IN THE NEGEV

NIBN | The National Institute for Biotechnology in the Negev Ltd.

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

TABLE OF CONTENTS

3.....The National Institute for Biotechnology in the Negev

4.....Overview

5.....NIBN in Numbers

6.....Missions

6.....Vision

7.....Why NIBN?

8.....Success Stories

10.....**Research at the NIBN**

Cancer

Infectious Diseases

Human Genetic Disorders

Neurodegenerative Diseases

Autoimmune and Metabolic Diseases

Applied Biotechnology

17.....**Research Support Units**

Bioinformatics Core unit

Genomic Analyses Unit

Cryo-Electron Microscopy Unit

Macromolecular Crystallography Research Center

Proteomics, Cytometry and Microscopy Unit

24.....NIBN Researchers

32.....NIBN Management

32.....NIBN Board of Directors

33.....NIBN Scientific Advisory Board

34.....The Edgar de Picciotto Family NIBN Building

35.....Ben-Gurion University of the Negev

THE NATIONAL INSTITUTE FOR BIOTECHNOLOGY IN THE NEGEV (NIBN)

"The establishment of a national biotechnology institute alongside Ben-Gurion University is key to the transformation of the Negev."

Ariel Sharon, former Prime Minister of Israel, May 2001

The NIBN, recognized nationally and internationally, fosters applied biotechnology and science, attracts and promotes scientific excellence, and serves as a hub for biotechnology development.

The NIBN's goal is to bridge the gap between basic and applied innovative research, to plant the scientific seeds that will lead to the commercialization of novel ideas and technologies developed at the NIBN, and contribute to the growth of a successful biotechnology industry in the Negev and in Israel as a whole.

OVERVIEW

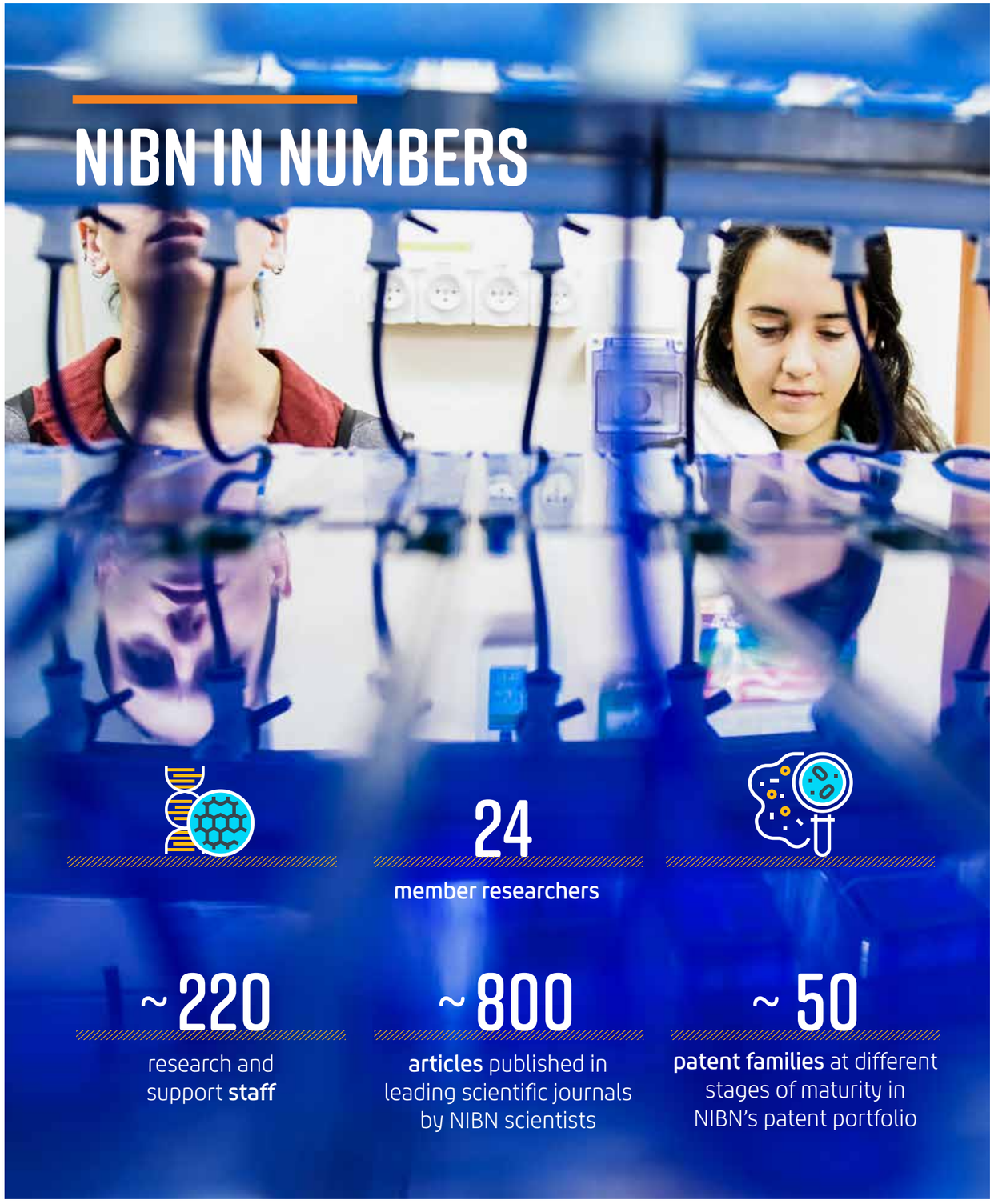
The National Institute for Biotechnology in the Negev Ltd. (NIBN), a unique research institute located within Ben-Gurion University of the Negev (BGU), is the first self-organized, independent research entity established under the auspices of a university in Israel. The NIBN was established as a company in November 2009, through a tri-lateral agreement between the Israeli government, Mr. Edgar de Picciotto and BGU.

The mission of the NIBN is to conduct multidisciplinary applied research guided by a clear biotechnology vision, to bridge the gap between basic and applied innovative research and facilitate the commercialization of novel ideas and technologies developed by NIBN researchers.

Research at the NIBN is focused in several key areas: cancer, infectious diseases, autoimmune and metabolic diseases, neurodegenerative diseases, human genetic disorders, and applied biotechnology, including AgBio. The focus on these topics unites existing strengths with resources unique to the NIBN and BGU.

The NIBN encourages its members to cross the academic barriers that have traditionally separated scientific disciplines and instead engage in creative and ground-breaking multidisciplinary biotechnological research with a commercialization potential. Located within Ben-Gurion University's main campus in Beer-Sheva, the NIBN represents a framework that is distinct from existing academic models, yet incorporates the creative university setting and dedication to research excellence, and creates an environment conducive to pioneering ideas.

The NIBN provides NIBN researchers with state-of-the-art laboratories, research grants, and infrastructure supporting units, as well as intellectual property and project management and business development leadership furnished by NIBN's professional management team.



MISSIONS

The NIBN, as a Center of Excellence, aims to pave the way from innovative research-driven discovery to commercialization. As such, the NIBN:

- Identifies cutting-edge, innovative and creative discovery-driven research among our researchers.
- Provides the necessary funding and “bridges the gap” between basic and applied biotechnological research, by leading preclinical Proof-of-Concept and development acceleration through support from the NIBN’s professional management team and integration of the Bio industry standards.
- Fosters intellectual property strategy and protection of novel ideas and technologies developed by NIBN researchers.
- Pursues the commercialization of the novel ideas, technologies and intellectual properties generated at the NIBN.
- Fosters dialogue between the NIBN and the Bio/Pharma industry to maximize the potential of exchanging ideas and technologies and to pursue research collaborations between the two entities.

VISION

Our vision is to plant the scientific seeds that will lead to commercialization of novel ideas and technologies developed by NIBN researchers and contribute to the growth of a successful biotechnology industry in the Negev and in Israel as a whole.

Today the NIBN is recognized nationally and internationally as a unique institute that fosters applied biotechnology and science, attracts scientific excellence and serves as a hub for biotechnology development.

Looking to the future, we envision that the NIBN will become a recognized global player and will have a significant impact on the economic prosperity of the University, of the Negev region and the nation as a whole.

WHY NIBN?

PARTNERSHIP, COLLABORATION AND INVESTMENT

BGU offers NIBN’s member researchers all the conditions necessary to perform applied cutting-edge discovery-driven research. Thanks to its Faculties of Engineering, Natural, and Health Sciences, the Ilse Katz Institute for Nanoscale Science and Technology and its affiliation with the Soroka University Medical Center, BGU is a natural home for the academic cooperation and the cross-fertilization of ideas and approaches central to the philosophy of the NIBN.

Under the umbrella of the BGU academic environment, the NIBN provides the infrastructure and settings conducive to collaboration between researchers, and in doing so facilitates the promotion of basic research, taking the selected projects through preclinical Proof-of-Concept and development acceleration, all the while aligning the research to adhere to Bio industry levels and standardization.

The NIBN is open to creating research collaborations with universities, research institutes, medical centers and the Bio industry aiming to maximize the potential of exchanging ideas and technologies.

The NIBN fosters dialogue with the Bio industry, venture capitals and potential investors to pursue business collaborations and licensing options.

NIBN’s main business strategy is to license out the technologies, either to be integrated into a Bio/Pharma company’s pipeline, or to establish a new company for the development of the licensed intellectual property and technology.

SUCCESS STORIES

GENETIC MANIPULATION OF CULTURED PRAWNS

■ After discovering the prawn's insulin-like androgenic hormone, Prof. Amir Sagi developed a novel biotechnological technique for turning male prawns into a special type of female who yields only male progeny of cultured prawns. The technology is the first to implement RNAi in the field of aquaculture, producing breeding stocks with only male progeny. Male prawns grow twice as large as female ones. Therefore, cultivating these transsexual prawns that only have male descendants can potentially double the profits for farmers and reduce by half the price of prawns on the market. The freshwater prawn industry has an annual market of 450,000 tons. The technology is licensed to the Tiran Group.

DIRECTED EVOLUTION IN TREATMENT OF PSORIASIS

■ Psoriasis is an autoimmune disease that affects millions of people, causing great suffering and costing billions to health care systems worldwide. One of the key signals involved in the progression of psoriasis is Interleukin 17 (IL-17), a pro-inflammatory cytokine. Using the directed evolution approach, in which an ensemble of mutants is screened for improved properties, Prof. Amir Aharoni's team engineered the extra-cellular soluble domain of the IL-17 receptor (IL-17R) that binds with high affinity to the natural IL-17 protein and inhibits the pro-inflammatory signals associated with psoriasis progression. The resulting engineered IL-17R had a superior binding and stability affinity relative to the natural receptor. The technology was licensed to Valin Technologies, Ltd.

CHECKPOINT ANTIBODY FOR THE TREATMENT OF CANCER

■ The interaction between the NKp44 receptor (isoform 1) expressed by NK cells and the membrane-associated PCNA expressed by tumor cells is considered an innate immune checkpoint exploited by various cancers to reduce NK-based immune response. Prof. Angel Porgador's research group developed a unique monoclonal antibody (mAb) to tumor cell membrane-associated PCNA that blocks this checkpoint and enhances NK activity in vitro and in vivo. The technology was licensed in collaboration with FutuRx, a biotechnology accelerator.

BEDOUIN INFANT MORTALITY REDUCTION THROUGH POPULATION GENETICS

■ Prof. Ohad Birk and his team have deciphered the molecular basis of nearly 30 severe human diseases, including some of the most common hereditary diseases in Bedouins and in Sephardic Jews. Prof. Birk has also implemented the research findings in routine screening tests for prevention of the diseases discovered, with proven success. There has been a 30% reduction in infant mortality in the Bedouin community within the past few years. Some of the diseases discovered are prevalent in the Arab world, with implications for large communities throughout the Middle East. His research has major implications for Jews as well: PCCA (Progressive Cerebello Cerebral Atrophy) and PCCA2, deciphered in Prof. Birk's lab, are the two most common severe hereditary diseases in Sephardic Jews. Free carrier tests for PCCA are now routine for Jews of North African and Iraqi ancestry, similar to Tay-Sachs for Ashkenazi Jews.

TARGETING MITOCHONDRIAL IMBALANCE IN AGING

■ A small organic lead compound, discovered by Prof. Orian Shirihai and his team, is being used to stimulate mitochondrial turnover and clearance. Impaired mitochondrial turnover is increasingly acknowledged to be a central factor in aging and in the etiology of several age-associated diseases (including Parkinson's, Huntington's, and Alzheimer's), as well as type-2-diabetes (T2D), in which mitochondrial turnover is suppressed, leading to the accumulation of damaged mitochondria and consequently to beta-cell dysfunction and apoptosis. The invention and IP for the treatment of T2D were licensed to Expire Bio, an incubator company in UCLA, USA.

NOVEL PLATFORM FOR TRANSPLANTATION DEVICES

■ Profs. Alon Monsonego and Smadar Cohen (Avram and Stella Goldstein-Goren Dept. of Biotechnology Engineering) developed a novel platform for transplantation devices that offers an immune-regulatory environment in a highly vascularized macroporous alginate scaffold. The immune-regulatory device is composed of alginate-alginate-sulfate with affinity-bound TGF-b, IL-10, VEGF and PDGF-b, all human recombinants. A sulfated alginate scaffold with insulin producing cells or islets for the treatment of diabetes was licensed out to Orgenesis Inc.

RESEARCH AT THE NIBN

The NIBN's multidisciplinary approach is applied to six major research clusters:

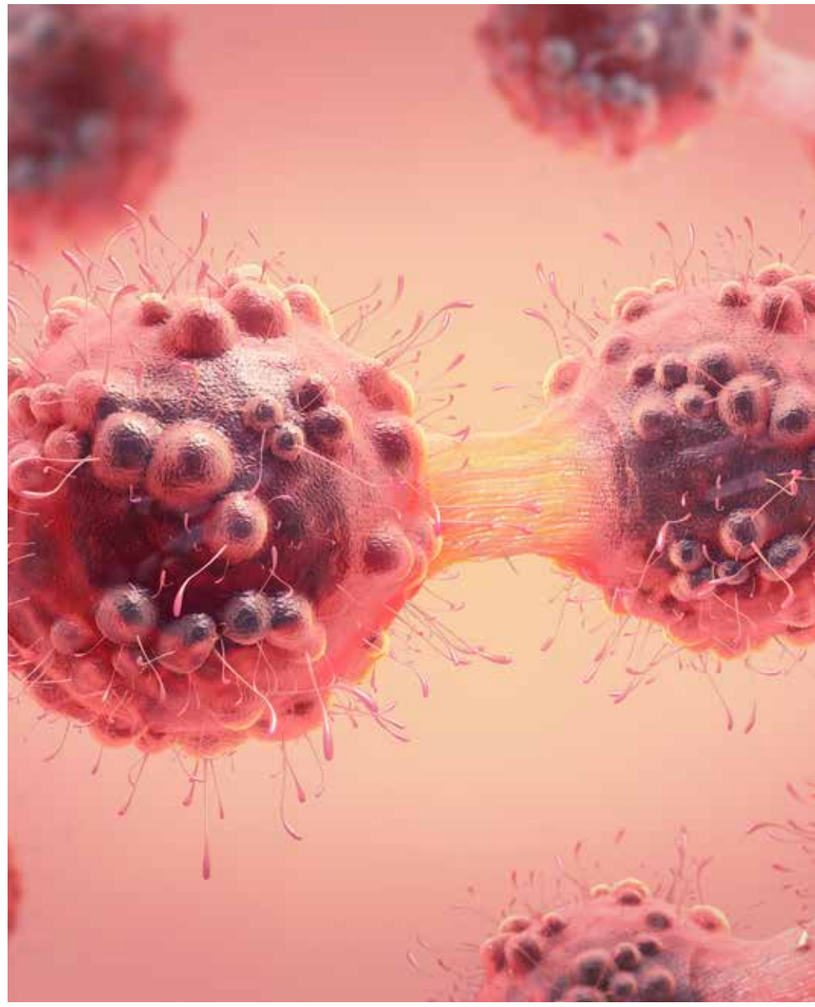
- Cancer
- Infectious Diseases
- Human Genetic Disorders
- Neurodegenerative Diseases
- Autoimmune and Metabolic Diseases
- Applied Biotechnology

Research in the clusters includes identification of new targets and the development of novel approaches for cancer therapy; new and groundbreaking therapeutic research for the treatment of neurodegenerative diseases; and generating innovative antibiotics via identification of unique targets and engineering superior anti-inflammatory proteins. The NIBN also promotes research in the burgeoning field of agricultural biotechnology (Agbio), to help make agriculture more sustainable and increase yields.

CANCER

Researchers:

Prof. Varda Shoshan-Barmatz
Prof. Angel Porgador
Dr. Dan Levy
Dr. Roi Gazit
Dr. Barak Rotblat
Dr. Niv Papo
Prof. Nir Peled, MD, PhD



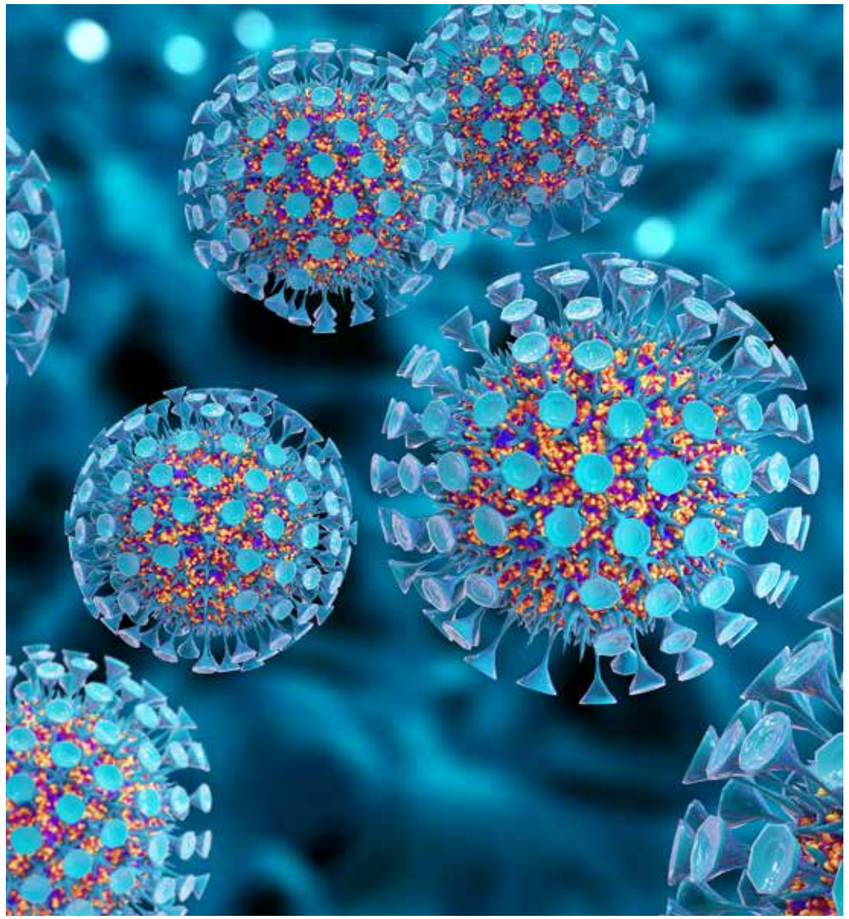
Cancer is one of the leading causes of morbidity and mortality worldwide, currently accounting for about 9 million deaths annually. Globally, nearly 1 in 6 deaths is due to cancer.

Current targeted and monotherapy approaches often fail to impact disease progression and patient survival. Consequently, the NIBN's cancer research group focuses on multidisciplinary approaches, including understanding cancer biology, by studying epigenetic modifications, metabolic reprogramming, dysregulated cell growth, evasion of cell death, and activation of mitochondrial dependent cell death, in order to generate better models, improve diagnoses, and to discover, design or develop new, more effective, anti-cancer therapeutics. Indeed, several new strategies for fighting cancer were developed, including those simultaneously attacking several oncogenic properties, some of which were commercialized.

INFECTIOUS DISEASES

Researchers:

Prof. Michael M. Meijler
Dr. Tomer Hertz
Dr. Natalie Elia
Dr. Eyal Gur



Several recent outbreaks of viral epidemics have highlighted the constant threat of zoonotic transfer of highly pathogenic viruses into the human population. Research in the infectious diseases group focuses on developing novel approaches to address these challenges. These include: (1) developing quorum-sensing inhibitors to disrupt the communication and coordination between bacteria that is necessary for their survival in biofilms; (2) developing novel inhibitors of ATP-dependent proteases that are essential for bacterial virulence; (3) discovering new anti-bacterial therapeutics; (4) developing novel rapid diagnostic assays for antibody dependent enhancement (ADE) following a second infection with Flaviviruses such as dengue; and (5) developing novel correlates of protection for vaccines.

HUMAN GENETIC DISORDERS

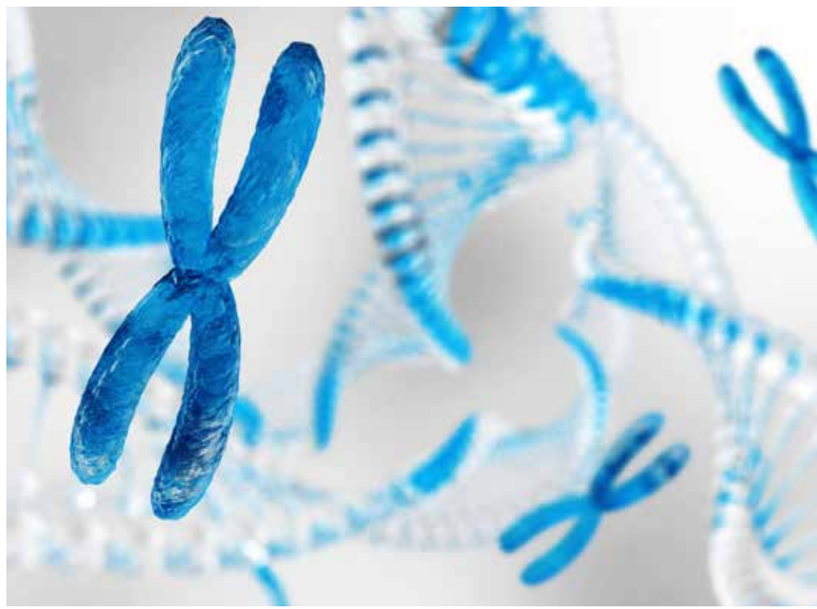
Researchers:

Prof. Ohad Birk, MD, PhD
Prof. Ruti Parvari
Prof. Esti Yeger-Lotem

The study of the genetic basis of disease in defined inbred communities offers a unique opportunity for identifying and characterizing disease-associated genes and drug targets.

The human genetic disorders group focuses on studies of unique cohorts, mostly the local consanguineous inbred Bedouin population, integrating diverse types of data for personalized diagnosis, such as protein structure data, and understanding and predicting the behavior of complex biological networks, as well as conducting and interpreting high-throughput experiments: from expression profiles and next-generation sequencing to molecular, biochemical studies in-vitro and in various model systems (from mutant drosophila, zebrafish, and mice, to patients' stem cells).

The group conducts functional genomic and proteomic studies to identify new drug targets, discover novel molecular pathways of disease, validate mechanisms of drug action, and develop diagnostic tools – for both rare and orphan diseases, as well as for common human disorders – through studies of their unique monogenic variants.



NEURODEGENERATIVE DISEASES

Researchers:

Prof. Alon Monsonego
Dr. Shira Knafo, MD, PhD
Prof. Varda Shoshan-Barmatz

The world's population is ageing, and the number of persons over the age of 60 is expected to more than double by 2050.

The progressive loss of neurons associated with ageing, including neuron death, is becoming a major clinical burden. Indeed, many neurodegenerative diseases, including Parkinson's disease, Alzheimer's disease, Huntington's disease and ALS, occur as a result of neurodegenerative processes. Therefore, discovering cellular mechanisms involved in neuronal loss may offer new diagnostic and therapeutic advances.

The NIBN neurodegenerative diseases group develops innovative immune and novel target-based therapeutic strategies for combatting neurodegenerative diseases. These include targeting common features of these diseases, such as mitochondrial dysfunction, and inhibiting neuronal cell death.

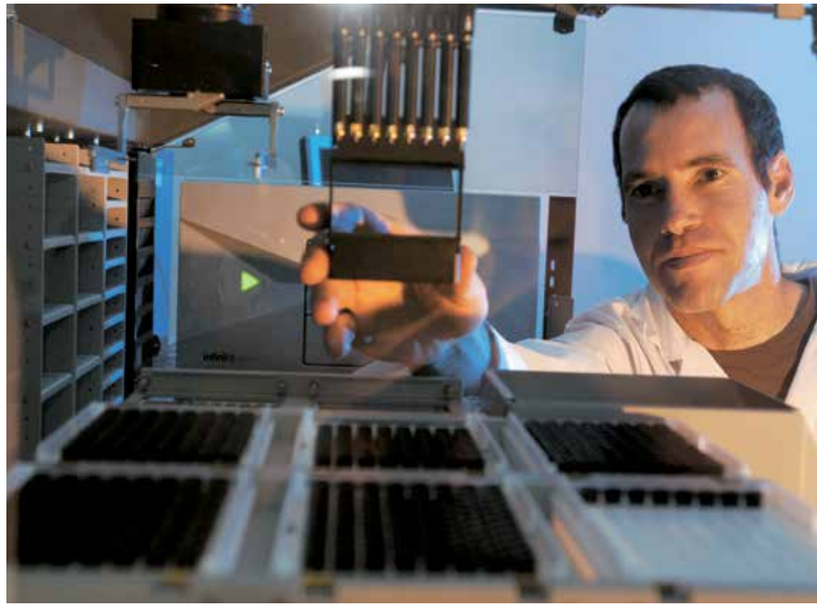
AUTOIMMUNE AND METABOLIC DISEASES

Researchers:

Prof. Amir Aharoni
Prof. Assaf Rudich, MD, PhD

Understanding the underlying mechanisms involved in the maintenance of homeostatic immune responses in normal and in disease states poses a significant challenge. The identification of the causes leading to an imbalance is relevant to a wide variety of conditions ranging from diabetes and obesity to immunological responses and vaccines.

The NIBN uses a robust platform called "directed evolution" to generate superior anti-inflammatory proteins to treat autoimmune diseases. The autoimmune and metabolic diseases group is also interested in metabolic dysfunctions related to the role of adipose tissue dysfunction in obesity and associated comorbidities, as well as the relationship between type 2 diabetes, mitochondrial function, ß-cell dysfunction and apoptosis.



APPLIED BIOTECHNOLOGY

Researchers:

Prof. Itzhak Mizrahi
Prof. Ohad Medalia
Prof. Amir Sagi
Prof. Raz Zarivach
Dr. Eyal Arbely
Dr. Gabriel Frank

Unravelling the structure-function relationships of proteins and molecular complexes will lead to increased understanding of cellular processes. The applied biotechnology group at the NIBN is comprised of prominent scientists and state-of-the-art research infrastructure in the fields of Ag-bio, microscopy, protein crystallography, and protein engineering, as well as nanotechnology.

Structural biology in conjunction with bioinformatics represents a key element in the process of novel drug design and development. NIBN researchers conduct structural studies spanning a wide spectrum of resolutions, from molecules to whole cells.

The group's current efforts include electron tomography of cells and organelles, engineering synthetic rumen microbiome, understanding the structural basis of ligand receptor interactions important in drug discovery, and proteomics related to reproduction and calcium bio-mineralization.

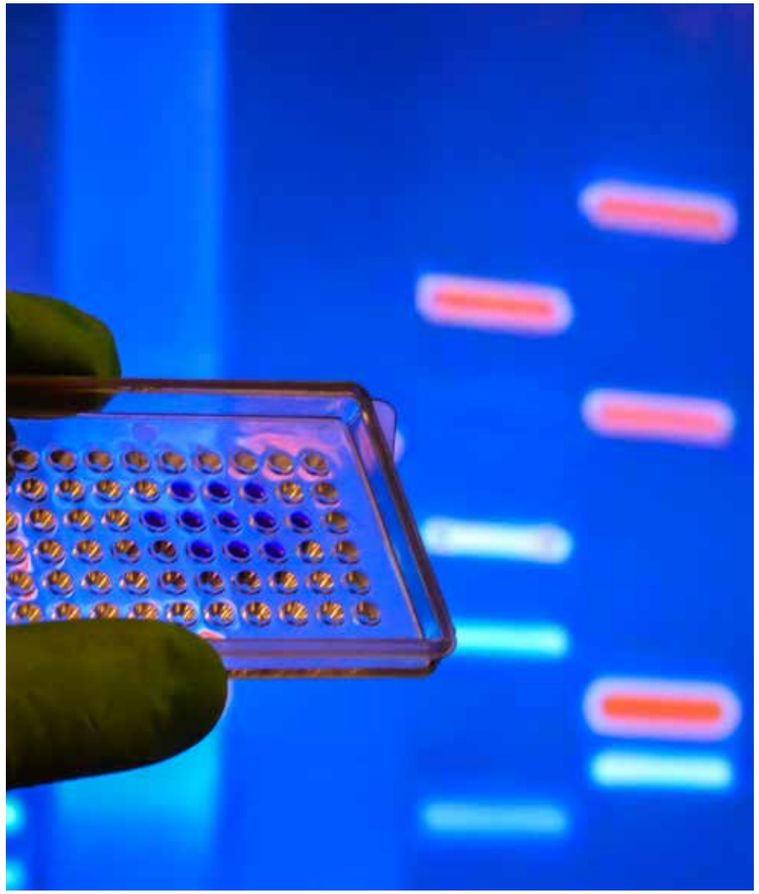
RESEARCH SUPPORT UNITS

NIBN's five infrastructure support units provide expertise on state-of-the-art equipment, primarily to support and advance research at the NIBN and BGU. The units also provide services to outside users from other universities, research institutes and Bio/Pharma companies, and support basic as well as applied research.

Examples of the services provided by these units include: the identification of novel proteins and their interactions with macromolecules (proteins, RNA and DNA), DNA microarray analysis, DNA sequencing, cell sorting, high-resolution microscopy, protein crystallization, robotic high-throughput screening and bioinformatics analysis.

BIOINFORMATICS CORE UNIT

Dr. Vered Chalifa-Caspi, Head



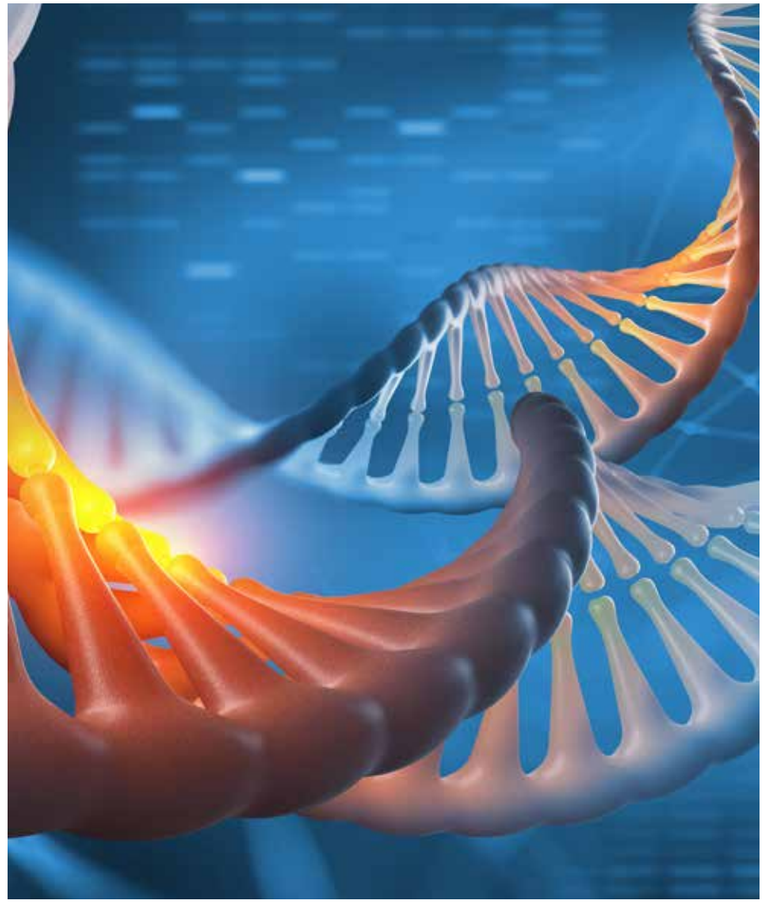
The aim of the Bioinformatics Core facility is to help scientists advance their research using cutting edge bioinformatics methodologies. The facility provides customized data analysis services and consultation to scientists at BGU and all over Israel, from both academia and industry. Main areas of expertise include the design and analysis of experiments that use genomic technologies (e.g., next-generation sequencing, mass spectrometry proteomics and metabolomics profiling, microarrays and more), as well as mining and re-analysis of publicly available datasets. In addition, the facility develops software tools for automation of data analysis workflows (NeatSeq-Flow, Microbe-Flow).

Bioinformatics services are provided for an extremely wide range of research areas, including basic research, biomedicine, biotechnology, agriculture, aquaculture and microbiology.

GENOMIC ANALYSIS UNIT

Dr. Micha Volokita, Head

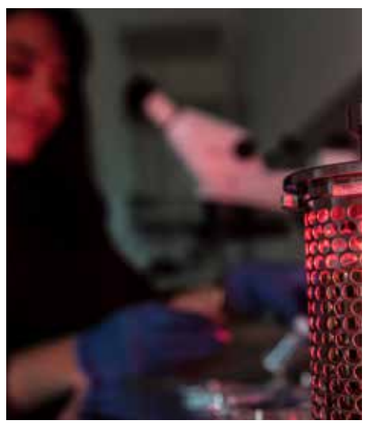
The Genomic Analysis Unit offers its services to NIBN and Ben-Gurion University researchers, as well as others in academia and industry. These services range from total DNA/RNA extraction to sequencing (using either Sanger DNA sequencing or next-generation sequencing) and genotyping. The unit also offers Illumina sequencing library preparations, including quality controls checks. Other services include Digital PCR quantification, high-throughput gene expression (by using Affymetrix micro-arrays) and single-cell isolation.



CRYO-ELECTRON MICROSCOPY UNIT

Dr. Ran Zalk, Head

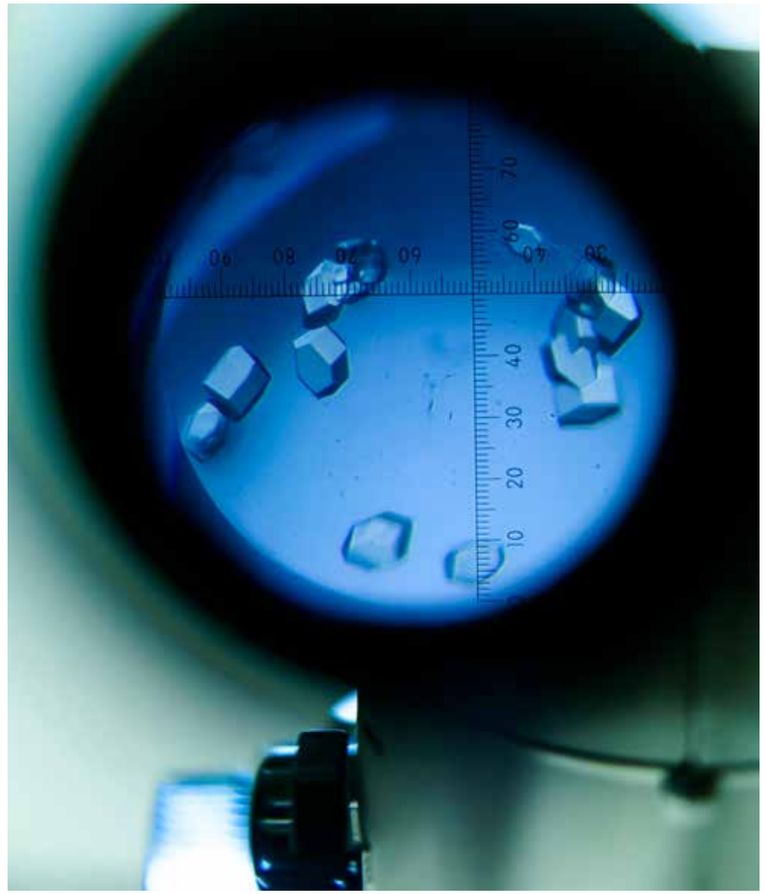
The Cryo-Electron Microscopy Unit provides the expertise and resources for solving macromolecular structures. For structural determination, a high-end transmission electron microscope (FEI Tecnai F30 Polara), a direct detection camera (Gatan K2 summit with Quantum GIF energy filter), and the computational support necessary for single particle analysis are available. Higher order structure determination is possible through tomographic reconstruction using the same setup. The unit also offers grid sample preparation expertise and equipment (Leica EM GP).



The equipment and services of the Cryo-Electron Microscopy Unit are available for use by NIBN members and BGU faculty, as well as researchers at other universities and in industry.

MACROMOLECULAR CRYSTALLOGRAPHY RESEARCH CENTER

Dr. Anat Shahar, Head



X-ray crystallography is the gold standard for determining biological structures at high resolution. Protein crystals are subjected to X-ray radiation and the pattern of diffraction obtained is used to solve the structure of the molecule. X-ray crystallography thus provides vital information about structure-function relationships and protein–protein and protein–ligand interactions. The Macromolecular Crystallography Research Centre (MCRC) provides expert services needed for determining the three-dimensional structure of a protein. These services begin with protein crystallization and continue through to crystal measurement and three-dimensional structural analysis. The MCRC also offers advanced robotics instrumentation to facilitate mass screening and imaging.

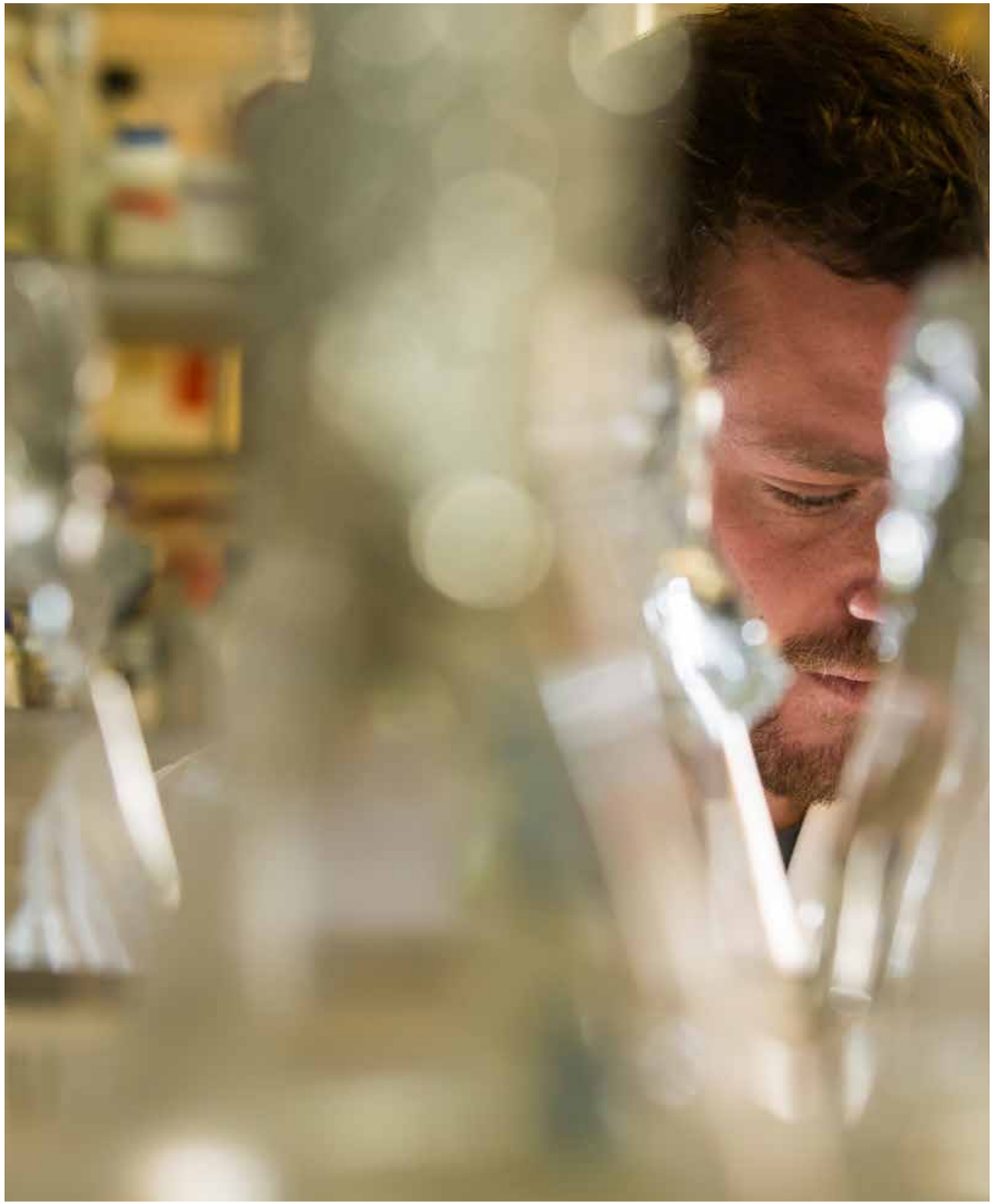
PROTEOMICS, CYTOMETRY AND MICROSCOPY UNIT

Dr. Alon Zilka, Head

The Proteomics, Cytometry and Microscopy Unit enables the study of single cells and different cellular populations at both spatial and temporal resolutions, thus allowing researchers to learn about time-dependent processes, neural growth, movement within cells, such as from the membrane to the nucleus, and other cellular events.

Furthermore, the unit offers the study of molecular interaction through the measurement of kinetic parameters (affinity, dissociation and association constants).

The services provided by the Unit include not only running experiments, but also assistance with experiment design, instrument choice, results analysis and teaching students how to operate the equipment.



RESEARCHERS

PROF. AMIR AHARONI

Prof. Aharoni's group develops and utilizes protein engineering approaches to generate novel proteins for autoimmune disease therapeutics, including those designed to treat psoriasis and Crohn's disease. Specifically, his group generates improved extracellular receptor domains that can block pro-inflammatory cytokines from binding to their endogenous receptors, thereby preventing autoimmune disease progression. These soluble receptor domains can then be used as drug candidates in the search for autoimmune disease therapeutics.

DR. EYAL ARBELY

Dr. Arbely approaches protein engineering from the perspective of genetic code expansion – the inclusion of non-canonical amino acids (those found outside the normal complement of 20 common amino acids directly encoded for by the genetic code). Dr. Arbely has two labs – one in synthetic chemistry and the other in biochemistry – to explore the full complement offered by this technique. His research has two main directions: the study of the human acetylome, leading to the development of novel biological therapeutics, and bio-orthogonal labelling to site-specifically label cellular components using small organic dyes with improved functionality.

PROF. OHAD BIRK, MD, PHD

Prof. Birk seeks to decipher the molecular basis of human hereditary diseases by studying monogenic diseases in unique inbred communities, both Arab-Bedouin and Jewish, where intermarriage results in increased frequency of these recessive diseases. Prof. Birk's lab has deciphered the basis of more than 30 human diseases, some of which are prevalent in Arab communities worldwide and others, which are some of the most common hereditary diseases in Sephardic Jews. Based on these findings, massive carrier testing is being implemented for disease prevention. The Birk team also conducts biochemical and developmental biology studies using Drosophila, zebrafish and mutant mouse models, as well as generating and analyzing patients' stem cells, to decipher downstream molecular pathways of these diseases. Through their studies, novel drug targets have been identified for common diseases, such as atrial fibrillation, osteoporosis, gout, multiple sclerosis, and attention deficit hyperactivity disorder (ADHD).

DR. NATALIE ELIA

Dr. Elia uses high-end microscopy to understand the mechanical principles of membrane fission in mammalian cells. Dr. Elia's group specifically studies the ESCRT machinery, a protein complex vital for membrane bending and budding in various physiological processes that can also be hijacked by retroviruses. The Elia team uses unique light microscopy systems to achieve the high spatial and temporal resolution needed for observing protein dynamics and macromolecular architecture in living cells. In addition, Dr. Elia is also developing new approaches for fluorescent labelling of proteins via genetic code expansion, together with NIBN member Dr. Eyal Arbely.

DR. GABRIEL FRANK

Dr. Frank is interested in establishing direct correlations between biochemical states and the conformations of molecular machines while they perform their tasks. The main tools used by the Frank group are cryo-electron microscopy (cryo-EM), which enables structural determination of proteins in near-native conditions, and optical spectroscopy, which allows for the detection and characterization of ligands at the single molecule level. Dr. Frank and his team are developing strategies designed to combine the two experimental approaches for the detailed analysis of several scientifically and medically important molecular machines and enzymes:

- ABC exporters, which translocate lipids, bile, and sterols across membranes, and contribute to multidrug resistance.
- Phospholipases that are modulated by bile.
- Membrane fusion machineries that mediate cell-cell fusion and viral infection.

DR. ROI GAZIT

Dr. Gazit studies hematopoietic stem cells (HSCs), the adult stem cells that give rise to all types of blood and immune cells. Not only are HSCs of vital importance for the entire blood and immune system, but they are also the functional unit enabling bone marrow transplants. Dr. Gazit's lab seeks to directly reprogram blood cells back into HSCs; to generate novel models for leukemia study and to understand HSCs' role within the immune-response. Using advanced molecular biology enables the discovery of key regulators for normal and for malignant HSCs. A better understanding of HSCs under stress will open up new opportunities to diagnose and minimize some of the pathologies associated with chronic inflammation.

RESEARCHERS

DR. EYAL GUR

Dr. Gur investigates the function and regulation of the Pup-proteasome system (PPS) – the system responsible for intracellular protein degradation – in *Mycobacterium tuberculosis*, the pathogen responsible for tuberculosis.

This system is essential to both the virulence of *M. tuberculosis* and its persistence in the human host for prolonged periods of time. Indeed, at present, one-third of the world's population are carriers of this microbe in a dormant form. Targeting the PPS system with new drug molecules that inhibit its activity will potentially severely inhibit the ability of *M. tuberculosis* to reside within a host.

DR. TOMER HERTZ

Dr. Hertz combines computational and traditional wet-lab approaches to study systems immunology within the context of vaccines and diseases. Specifically, he wants to know the role of immune history and memory – how exposure to previous infections will affect the response to a future infection – his theory being that the immune system's memory from previous exposures can act as an accurate predictor of how it will respond in the future. The potential applications of this approach are broad, aiding clinicians performing vaccine trials in answering why a specific vaccine may work in some subjects but not others, and aiding physicians in determining which treatments may be effective or ineffective for a given patient.

DR. SHIRA KNAFO, MD, PHD

Dr. Knafo seeks to identify the molecular and synaptic mechanisms underlying learning and memory, cognitive malfunction and cognitive enhancement. This knowledge is further translated to developing novel approaches for memory enhancement.

DR. DAN LEVY

The major focus of Dr. Levy's laboratory is to elucidate the biological roles of lysine methylation in modulating intracellular signaling pathways. The Levy team relies on interdisciplinary biochemical and cellular approaches, combined with cutting-edge genomic and proteomic tools, to decipher the molecular mechanisms by which lysine methylation, through epigenetics programs, regulates oncogenic and cell differentiation processes. Dr. Levy and his colleagues seek to identify new events of methylation of histone and non-histone proteins, to define the molecular mechanisms by which these methyl marks are generated and transduced, and to unravel the biological functions of such methylation events. The long-term goal of the group is to exploit this knowledge for the development of new cancer therapies.

PROF. OHAD MEDALIA

Prof. Medalia's group develops and utilizes structural approaches to investigate cellular processes in health and disease. In particular, the group focuses on developing novel markers for cryo-electron tomography, based on nanoclusters. In addition, the Medalia team has identified a novel family of proteins, which can restore lamin localization in patient cells. This same approach is being used in studies addressing blood clot prevention.

PROF. MICHAEL M. MEIJLER

Prof. Meijler studies interspecies chemical communication and quorum-sensing in bacteria, using a chemical biology approach. Quorum-sensing has to do with the way bacteria use chemical signals to affect their decisions, which can then lead to infections, can determine whether a bacterial population is competitive with another population, and can affect behavior, virulence, infectivity and survival. At present, large amounts of antibiotics are used – with increasing ineffectiveness, as multi-drug resistance increases – to address bacterial infections. Prof. Meijler has identified and developed new molecules that can inhibit the communication between bacteria and suppress their virulence so that the bacteria do not inflict damage on their host.

RESEARCHERS

PROF. ITZHAK MIZRAHI

Microbial communities (microbiomes) can be found everywhere and drive many basic processes in everyday life, including agriculture, health and environment. Prof. Mizrahi's group is involved in understanding the ecological and evolutionary forces that shape microbial communities in nature, and specifically in gut environments. Understanding these forces enables us to predict and modulate the composition of the microbiome towards optimized functionality. One such application involves tuning the bovine microbiome so as to decrease environmental impact and increase available food resources for mankind.

PROF. ALON MONSONEGO

Defining the impact of immune regulation in many disorders is a fast-emerging field that holds great promise for improving quality of life for those afflicted by such conditions. Prof. Monsonego investigates the link between the immune system and the central nervous system to understand how communication between these two decision-making systems affects susceptibility to and progression of both age-related psychiatric and neurodegenerative conditions, such as Alzheimer's disease, and autoimmune diseases like multiple sclerosis. The ultimate goal of Prof. Monsonego's research is to provide better tools for the early diagnosis and treatment of neurodegenerative and autoimmune diseases, two conditions with ever-growing social and financial costs.

DR. NIV PAPO

Dr. Papo develops high-affinity proteins using a combination of experimental and computational methodologies to bind to and antagonize a variety of disease-related targets. He engineers novel proteins through both random and rational approaches to improve their selectivity, such that they more specifically target receptors that are overexpressed in disease states but expressed at normal levels in healthy cells. In doing so, Dr. Papo's lab generates novel bio-therapeutics and enhanced imaging agents.

PROF. RUTI PARVARI

Prof. Parvari identifies mutations causing genetic diseases as a tool to find novel candidate genes for drug therapy. A developed network of clinicians at the Soroka University Medical Center provides the project with subject families with various diseases, such as thyroid carcinomas, heart diseases, male infertility and more.

Prof. Parvari employs state-of-the-art genetic techniques – whole genome and exome next generation sequencing and genotyping deciphered by bioinformatics – to identify the target genes. These provide the functions and pathways that are affected, which are then further investigated using molecular biology immunology and physiological techniques on tissue cultures and animal models.

The very identification of such disorders can have a major beneficial impact on those potentially affected, since families with terrible genetic diseases live in fear of passing on these genes. Her work and insights are entered into a database used for genetic screening by many in the Bedouin population.

PROF. NIR PELED, MD, PHD

Prof. Nir Peled is the Head of Oncology at the Soroka Cancer Center and a leader in the field of lung cancer. He is board-certified in internal medicine, pulmonology and medical oncology. Prof. Peled focuses on the wide translational and clinical perspectives of lung cancer and, including personalized targeted therapy in lung cancer, biomarkers development, immuno-oncology and early detection. He has published more than 150 peer-review articles, including guidelines to early diagnosis of lung cancer, biomarker development and treatment of advanced disease.

PROF. ANGEL PORGADOR

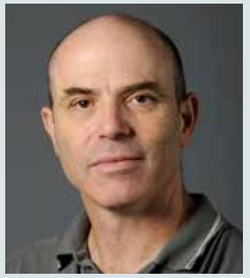
Prof. Porgador is interested in the innate immune system that acts as the first line of defense against disease. His research is broad, frequently drawing inspiration from the immune system for investigations of other settings. For example, he is working to understand how some diseases, such as cancer, are able to commandeer the immune system to avoid destruction, and in doing so he is identifying new ways to direct the immune system to target cancers.

In addition to his involvement and research in cancer, Prof. Porgador utilizes his expertise in immunology towards understanding mechanisms involving the immune system and neurodegenerative diseases

RESEARCHERS

DR. BARAK ROTBLAT

Dr. Rotblat studies the molecular biology of cancer by examining the role of long non-coding RNAs (lncRNA) and regulators of mRNA translation. Among other functions, lncRNAs control regulation in cells. Protein content analysis shows that a cancerous cell is very similar to a normal cell from the same tissue; for example, a cancerous breast cell is more similar to a breast cell than to a cancerous cell in the lung. However, while the protein profiles of healthy and cancerous cells from a given tissue are very similar, their lncRNA content is very different. Therefore, lncRNA are promising drug and therapeutic targets. Regulating mRNA translation is key to the cellular mechanism by which tumor cells adapt to stress. Dr. Rotblat and his colleagues seek drug targets and inhibitor molecules aimed at processes that are used by cancer cells to adapt to starvation conditions, such as those found in tumors.



PROF. ASSAF RUDICH, MD, PHD

Prof. Rudich studies obesity and related diseases to understand how changes in the biology of adipose tissues (fat) contribute to these conditions. He seeks to use microRNA-based therapies to reverse not obesity itself, but the metabolic outcomes resulting from the dysfunctional adipose tissue. Identification of relevant miRNAs for treatment of metabolically complicated obesity can potentially lead to development of miRNA-based therapeutics or the identification of a potential druggable target for other therapeutic moieties.

PROF. AMIR SAGI

Prof. Sagi studies reproduction and growth in commercially important crustaceans to understand sex differentiation and how these animals/organisms grow their exoskeletons. His research on sex differentiation has already led to several successful commercial applications creating single-sex populations of crustaceans through non-GMO means – for example, this can be important to the food industry, where larger males fetch a premium price while females are homogeneous and their culture could be intensified – and he is working towards using these as biocontrol agents for pests and invasive species. Prof. Sagi's work on crustacean exoskeletons also aims to develop products for bone substitutes and tooth regeneration.

PROF. VARDA SHOSHAN-BARMATZ

Prof. Varda Shoshan-Barmatz was the NIBN's founding Director (2006-2015), and oversaw the development of its scientific infrastructure throughout the NIBN creation phase and the subsequent decade.

Prof. Shoshan-Barmatz studies metabolic diseases associated with mitochondrial dysfunction. Specifically, she focuses on the protein VDAC1 (voltage-dependent anion channel), which serves as a mitochondrial gatekeeper, controlling the metabolic and energetic cross-talk between mitochondria and the rest of the cell, and which is also a key protein in mitochondria-mediated apoptosis. Due to the central role of VDAC1 in the life and death of the cell and its dysregulation in diseases – including cancers, Alzheimer's disease, cardiovascular diseases and type 2 diabetes – VDAC1-based strategies are being developed as potential therapeutics for medical intervention in these diseases.

The multifunctional VDAC1 protein is involved in many other diseases in addition to cancer. It is through this understanding of the multiple roles of VDAC1 that Prof. Shoshan-Barmatz has become a key investigator in the neurodegenerative disease group as well.

PROF. ESTI YEGER-LOTEM

Prof. Yeger-Lotem is a computational biologist who develops integrative methods that rely on big data to understand disease mechanisms.

Inspired by the observation that proteins work by interacting with other molecules, Prof. Yeger-Lotem's research uses molecular interaction networks to model cellular processes. The models she builds provide a skeleton of information that help elucidate the impacts of mutations and the effects of drugs, and exposes previously hidden drug targets.

The open web-tools that Prof. Yeger-Lotem's lab has developed provide valuable output for NIBN members and industry alike by, for example, deciphering and giving meaning to large-scale sequencing and expression profiles, and by effectively prioritizing a list of potential drug targets.

PROF. RAZ ZARIVACH

Prof. Zarivach utilizes structural biology and the insights gained into the structure-function relationship of proteins to develop new biotechnologies. Specifically, he studies the natural formation of magnetic materials in a specific type of bacteria, in order to determine if the complement of genes are proteins that govern and guide this process, with the aim of reproducing, modulating and/or improving it. In doing so, Prof. Zarivach's lab works towards the goal of using magnetic nanoparticles to improve magnetic imaging techniques, such as MRI, and to use magnetic-induced hyperthermia to target and destroy cancerous cells.

NIBN MANAGEMENT

DR. OSNAT OHNE, CEO

Dr. Ohne was appointed CEO in December 2017. She has worked in the pharmaceutical industry for 18 years in various senior managerial positions, including 10 years as a Director-Project leader in Global Innovative R&D at Teva Pharmaceutical Industries. Over the years, Dr. Ohne served, in parallel, as an independent consultant to venture capital funds, university technology transfer units, start-ups and bio accelerators, mainly supporting early stage innovative drug development projects. Dr. Ohne received her PhD in Immunology from the Dept. of Microbiology at Tel Aviv University's Sackler Faculty of Medicine in 2001.

DR. SHARON FIREMAN, EXECUTIVE DIRECTOR - BUSINESS DEVELOPMENT

Dr. Sharon Fireman joined the NIBN in 2018. She has 12 years of experience in the pharmaceutical industry, in both startup and corporate organizations. Dr. Fireman was Director of Project Management at Teva Pharmaceuticals where she managed drug development processes and also led Teva's first global challenge competition to find novel solutions to unmet patient needs. Dr. Fireman holds a PhD in Chemistry from the Hebrew University of Jerusalem and an MBA (Strategy and Entrepreneurship) from Tel Aviv University.

DR. RON LAHAV, EXECUTIVE DIRECTOR - RESEARCH AND DEVELOPMENT

Dr. Lahav was recruited for the position of Executive Director R&D in September 2017. Dr. Lahav obtained his PhD in Biology at Ben-Gurion University of the Negev, followed by a post-doctoral fellowship at Princeton University in the Department of Molecular Biology. Dr. Lahav has worked in the pharmaceutical industry for almost 15 years in several leadership and executive management positions.

PROF. MICHAEL M. MEIJLER, SCIENTIFIC DIRECTOR

Prof. Michael Meijler obtained his MSc degree in Chemistry from the University of Amsterdam and his PhD degree from the Weizmann Institute of Science (with Abraham Shanzer). He then moved to the Scripps Research Institute in California, for postdoctoral studies with Kim Janda. After spending a year as Assistant Professor in the Janda group in 2005, he started his own group at the Dept. of Chemistry at BGU and was promoted to Associate Professor in 2011 and Full Professor in 2015. He has been a member of the NIBN since 2009, and is Chair of the Dept. of Chemistry since August 2018.

MAYA PITSHADZE , CHIEF FINANCE OFFICER

Maya Pitshadze holds an Executive MBA from Ben-Gurion University of the Negev and a BA in Economics and Computer Science from Bar Ilan University. She has over 18 years of experience in senior positions in the field of financing, including a position at an international pharmaceutical company. She has been at the NIBN since its founding and established its financial and administrative systems.

DR. NOAM DIAMANT, EXECUTIVE DIRECTOR - INTELLECTUAL PROPERTY

Dr. Noam Diamant is a biomed professional with a strong academic background, industry R&D experience and a profound understanding of intellectual property strategy and management. Dr. Diamant received his PhD in the field of DNA damage repair from the Weizmann Institute of Science. In 2013, he co-founded Ingenium IP, a consultancy firm specializing in IP strategy for the biomed sector, providing in-house IP management services tailored to the client company's needs. Dr. Diamant has managed the NIBN's patents portfolio since 2014.

NIBN BOARD OF DIRECTORS

Chairperson: **Prof. Raymond Dwek CBE, FRS**
Head of the Glycobiology Institute, University of Oxford

Prof. Daniel Chamovitz
President, BGU

Mr. David Bareket
Vice President and Director General, BGU

Prof. Raz Jelinek
Vice President and Dean for R&D, BGU

NIBN SCIENTIFIC ADVISORY BOARD

Chairperson: **Prof. Hermona Soreq**
Professor of Molecular Neuroscience, the Hebrew University of Jerusalem

Prof. Roger D. Kornberg
Recipient of the 2006 Nobel Prize in Chemistry
Professor of Structural Biology, Stanford School of Medicine

Prof. Aaron Ciechanover, MD
Recipient of the 2004 Nobel Prize in Chemistry
Distinguished Research Professor in the Rappaport Faculty of Medicine, Technion - Israel Institute of Technology

Prof. David Sidransky, MD, PhD
Director of Head and Neck Cancer Research, the Department of Otolaryngology, Johns Hopkins School of Medicine

Prof. Gideon Rechavi, MD
Founder and Head of the Sheba Cancer Research Center
Prof. of Hematology in the School of Medicine at Tel-Aviv University

Prof. Yoram Reiter
Professor of Immunology and Dean of the Faculty of Biology, Technion - Israel Institute of Technology

Dr. Ronit Bendori
Dr. Ronit Bendori is a General Partner at Evergreen Venture Partners, focusing on investments in the Healthcare sector

THE EDGAR DE PICCIOTTO FAMILY NIBN BUILDING

Edgar de Picciotto

A Man of Vision (1929-2016)

The NIBN as it stands today is the brainchild of banker and philanthropist, Mr. Edgar de Picciotto of Geneva, Switzerland. Mr. de Picciotto was the driving force behind the establishment of the NIBN, having provided the incentive, vision and financial support to establish this innovative scientific research institute. He recognized the need to expand and develop biotechnology research in the Negev in the mid-1990s, and his vision and drive ultimately led to the NIBN's establishment in 2009.

De Picciotto's legacy is felt every day as the NIBN fulfills its mission to make real contributions to patients' wellbeing worldwide.

The Edgar de Picciotto Family National Institute for Biotechnology in the Negev Building, designed by Chyutin Architects, was completed in 2015. The visually stunning building, situated at the southwestern corner of the BGU Marcus Family Campus, provides state-of-the art laboratory and office spaces on the top three floors, which stand above a transparent ground floor for NIBN and BGU events. The open ground floor fosters interaction between researchers, enhancing the exchange of knowledge and strengthening academic ties across disciplines.

The building won the Israeli Design Award for 2018 in the public buildings category.

Produced by the Department
of Publications and Media Relations
Ben-Gurion University of the Negev
Design: Studio Rave-Peleg
Photography: Dani Machlis
Illustrations: Shutterstock, istockphoto
June 2019

BEN-GURION UNIVERSITY OF THE NEGEV

Ben-Gurion University of the Negev (BGU) is the fastest growing research university in Israel. With 20,000 students, 4,000 staff and faculty members, and three campuses in Beer-Sheva, Sede Boqer and Eilat, BGU is an agent of change, fulfilling the vision of David Ben-Gurion, Israel's legendary first prime minister, who envisaged the future of Israel emerging from the Negev. The University is at the heart of Beer-Sheva's transformation into a cyber and biotech hub, where leading multinational corporations eagerly leverage BGU's expertise to generate innovative R&D.

As it counts up to its fiftieth anniversary, BGU's mission continues to be effecting change, locally, regionally and internationally. With faculties in Engineering Sciences; Health Sciences; Natural Sciences; Humanities and Social Sciences; Business and Management; and Desert Studies, BGU is a university with a conscience, active both on the frontiers of science and in the community. Over a third of our students participate in one of the world's most developed community action programs.

The University is a recognized national and global leader in the fields of nanotechnology, cybersecurity, Israel studies, drylands agriculture, biotechnology, robotics, alternative energy, hydrology, social leadership, hotel and tourism management and much more, actively encouraging multidisciplinary collaborations with government and industry, and nurturing entrepreneurship and innovation in all its forms.

Contact us at:

nibn@bgu.ac.il

Tel: ++972-8-647-7193

www.nibn.co.il