

BIG IDEA: COLLABORATE TO FIND A CURE

# TECHNION INTEGRATIVE CANCER CENTER TO CHANGE LANDSCAPE OF CANCER TREATMENT



TICC:  
INTEGRATING  
DISCIPLINES

Basic Cancer  
Research  
@ Medical  
School

Chemistry,  
Nanotechnology,  
Computation,  
Materials Science  
@ Main Campus

Clinical Research  
and Trials  
@ Technion-  
affiliated  
Medical Centers

Cancer is the second-leading cause of death in the United States, exceeded only by heart disease. The statistics are sobering. An estimated 589,430 Americans are expected to die of cancer in 2015, enough to fill the seats of Yankee Stadium 11 times over. Some 4,543 new cases will be diagnosed daily, and as the average life expectancy climbs, so does the risk of getting cancer.

Source: American Cancer Society

Defeating a disease as complex and devastating as cancer requires all the resources we can marshal. The Technion is ideally positioned to meet the challenge.

Distinguished Professor Aaron Ciechanover, left, heads the Technion Integrative Cancer Center (TICC), which focuses its research on obstacles to a cure.

Below, Associate Professor Ester Segal is developing silicon drug carriers at the TICC that are promising effective, focused treatments for cancer.



In tiny Israel, with one-fortieth the population of the U.S., the numbers are not much different proportionately, with approximately 15,000 patients dying yearly, says Technion Distinguished Professor Aaron Ciechanover, who serves as President of the Israel Cancer Association.

Here's the good news: Technion scientists have gained a deep understanding of the underlying mechanisms of cancer and are making inroads to combat the disease. The seminal discovery of the ubiquitin system by Nobel Prize-winning Technion scientists Avram Hershko and Ciechanover made possible the development of the drug Velcade, which has saved victims of multiple myeloma, a cancer of the bone marrow. Personalized cancer treatment is on the horizon. And new methods for controlling cancer growth provide hope that the once-lethal disease will become manageable.

But the war is not yet won. Whereas some cancers have

been partially defeated, others have become more common and aggressive. Cures are stymied by chemotherapy-resistant tumors and by the very real threat of metastasis (the spread from the primary site to other parts of the body).

#### THE TECHNION ADVANTAGE

Cancer is a collection of complex diseases that demands complex multidisciplinary solutions. The Technion is ideally positioned to meet the challenge. It is the only institute in Israel to combine expertise in the physical sciences and engineering with the basic cancer research already underway at the Technion Rappaport Faculty of Medicine. Add to that already rich mix the close proximity of the Technion-affiliated Rambam Health Care Campus and its impressive Oncology Institute.

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## CHAMPIONS IN THE FIGHT AGAINST CANCER

Marvel comic book fans may remember the classic superhero who worked to make the world a better place. In real life, Marvel CEO Isaac Perlmutter and his wife Laura have become superheroes in their own right by providing a major gift to support innovative cancer research at the Technion and NYU Langone Medical Center in New York City.

Isaac and Laura gifted \$9 million to fund collaborative cancer research endeavors between the Technion and NYU Langone. The donation will advance joint research between the two institutions, and has made possible the recruitment of Dr. Eyal Gottlieb.

"Ike and I have long sought for ways to link state-of-the-art scientific and research advances made in Israel with our deep commitment to NYU Langone Medical Center," said Laura in announcing the gift in February 2015. "The partnership between the Technion and NYU Langone allows us to launch a focused cancer research and treatment approach. We are confident that this collaborative effort, which creates efficiencies among marquee researchers, will lead to dramatic results in the fight against this terrible disease."

The first \$3 million of the grant will finance six cancer-focused research projects that will be spearheaded by scientists from both NYU Langone and the Technion. The remaining \$6 million will be used to establish the Laura and Isaac Perlmutter Metabolomics Center in the new Technion Integrative Cancer Center, which will be headed by Dr. Gottlieb.

The Perlmutter's gift is the latest in their efforts to combat cancer. In January 2014, they gave more than \$50 million to promote cancer research and treatment at NYU Langone, building on \$8 million in prior contributions. NYU Langone renamed the NYU Cancer Institute after them.

Isaac grew up in Israel, served in the Israel Defense Forces and immigrated to the U.S. when he was 24. The recent Technion-NYU Langone collaboration recognizes the Perlmutter's commitment to wed Israel's strengths as a global technological leader with those of other elite institutions.

"NYU Langone and the Technion have a shared, longstanding commitment to advancing cancer research," said Dafna Bar-Sagi, Senior Vice President and Vice Dean for Science at NYU Langone, Chief Science Officer at NYU School of Medicine, and a principal architect of the NYU Langone-Technion partnership. "We are at a great moment in our institutions' illustrious histories, a point from which we can jointly leverage the talent and creativity of our researchers toward accelerating breakthroughs. The foresight and the generosity of the Perlmutter ... will have tremendous impact."



Leveraging those resources, the Technion Integrative Cancer Center (TICC)—is certain to take the fight against cancer to an even higher level. "This is an ideal collaboration," says Prof. Ciechanover. "Cancer is one of the greatest challenges of our times. I expect that this Institute will impact not only the State of Israel, but also the world at large."

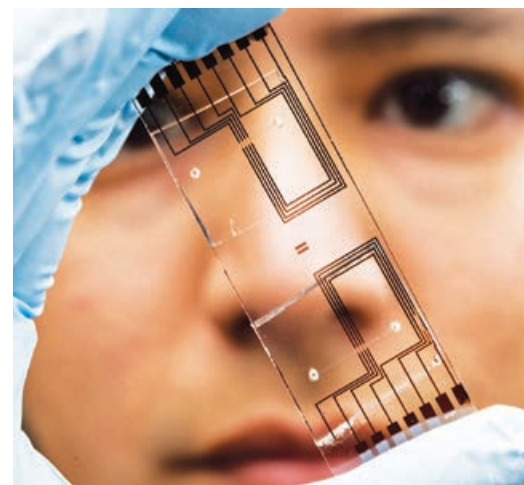
The TICC will focus on life-changing solutions such as early cancer detection, overcoming drug-resistant tumors and developing new approaches for targeted drug delivery. The interaction of researchers and clinicians will help translate basic discoveries into medical applications, culminating in clinical trials—a "bench to bedside" approach.

With a research budget a fraction the size of its U.S. counterparts, the Technion has figured out how to do more with less. A recent survey conducted by MIT ranked the Technion the sixth most innovative research institute in the world. The TICC is expected to yield at least the same extraordinary rate of return.

## SCIENCE SUPERSTARS

Prof. Ciechanover will co-head the TICC along with Dr. Ze'ev Ronai, who was recently recruited from his post as Scientific Director at Sanford-Burnham-Perbys Discovery Research Institute, La Jolla campus. Dr. Ronai earned his doctorate in Tumor Immunology from the Hebrew University of Jerusalem and is a world-renowned expert in cancer biology and signal transduction pathways—processes that are involved in determining whether a cancer cell will continue to grow or die, metastasize or lay dormant. His background will complement Prof. Ciechanover's research on the ubiquitin system, which is responsible for the degradation of defective proteins that can damage a cell.

The strong leadership of Dr. Ronai and Prof. Ciechanover will be further enhanced by the recruitment of Dr. Eyal Gottlieb from the Cancer Research UK, Beatson Institute in Glasgow, Scotland, where he served as Director of the Cancer Metabolism Research Unit. Dr. Gottlieb's work on cancer metabolism and metabolomics involves the chemical changes in the behavior of cancer cells, which can lead to the development of innovative treatments. His recruitment was made possible by a gift from Laura and Isaac Perlmutter (see box at left), who are funding the Laura and Isaac Perlmutter Metabolomics Center within the TICC and the Laura and Isaac Perlmutter Chair of Cancer Research. Dr. Gottlieb will head the Perlmutter Metabolomics Center and be the first professor to hold the Chair.



The Technion Integrative Cancer Center will take the fight against cancer to an even higher level.

## ABOUT THE TICC

The idea was born out of discussions among existing cancer researchers in the Faculty of Medicine—Professors Ciechanover, Gera Neufeld, Israel Vlodavsky and Amir Orian. “We already do everything together, from educating the students to buying equipment, conducting seminars and co-publishing papers,” explains Prof. Orian, who studies common fruit flies for insights into human cancer. Their joint efforts have led to at least five different compounds that are currently in different stages of clinical trials.

“We have created a very collegial, integrative environment to study cancer,” he says. “So we started to think about the future.” The TICC was the next logical step.

Despite recent advances in cancer therapy, there is still no solution to many critical problems facing cancer patients today. TICC scientists have identified five “unmet needs” and will focus their research on these most pressing obstacles: resistance to chemotherapy, metastasis, tumor dormancy, cancer prevention, tumor diversity and mutability. To do so, the TICC will integrate basic cancer research at the Rappaport Faculty of Medicine and expertise on the main campus in chemistry, materials science, nanotechnology and computation (key to devising new drugs and drug delivery techniques), with clinical trials and research conducted at Rambam and four other Technion-affiliated medical centers. The goal is for the clinic to help drive the research and vice versa—improving both of their games.

With that structure in place, the TICC will establish a basic drug discovery unit within the Faculty of Medicine. This unit will be the heart of the TICC, where scientists will discover new targets of future medicines, biomarkers for prevention or diagnosis of tumor growth, fresh paradigms of cancer development and other novel therapies.

Initially, the TICC will focus on seven specific cancers: pancreatic, hematological, melanoma, brain, colorectal, breast and prostate. Its scientists will also address various risk factors for cancer such as obesity, inflammation, diabetes and related metabolic stress syndromes.

Defeating a disease as complex and devastating as cancer requires all the resources one can marshal. Technion scientists have already made significant advances in

The road to a solution starts with Technion scientists such as TICC co-head Dr. Ze’ev Ronai (far left).

many areas, including tumor progression and suppression, metastasis, targeted drug delivery and cancer diagnosis. “We won’t wake up one day to find that cancer has gone forever,” says Prof. Ciechanover, “but we will conquer cancer one disease at a time.”

“I can say with pride that we have impacted the lives of millions of people worldwide, which is a great source of satisfaction,” he adds. With the new TICC, the Technion’s reach will be even greater. “The Technion is probably one of the few institutions in the world that has the ability to bring together all the apparently independent but actually interdependent elements in order to win this battle,” says Prof. Ciechanover. “At the end, I truly hope, I almost feel, that we are going to live in a cancer-free world.”

## CROWN FAMILY GIFT FUNDS TECHNION CANCER RESEARCH

A generous gift from the Crown Family of Chicago will provide the equipment, personnel and operating costs to address one of the most critical elements of the TICC, namely the microscopic tissue analyses that allows researchers to define new markers for detection and monitoring of tumor development, tumor metastases and early detection of cancer. It will also enable doctors to monitor the efficacy of treatment and to possibly predict whether the patient will be cured, or to detect an unfortunate recurrence of the disease.

The gift will also enhance recruitment and retention efforts of outstanding faculty, and help build an interdisciplinary team of doctors, scientists and engineers for diagnosis and related work to treat cancer. The recruitment packages for one full professor and two assistant professors will include the construction of top-level physical facilities, state-of-the-art equipment, technical support and the necessary resources to carry out their research.

The Crown Family has a long history of supporting the Technion. Lester Crown received a Technion Honorary Fellowship in 1996, and was awarded the Albert Einstein Award—the ATS’s highest honor—in 1994 in recognition of his service to the organization.

