The background of the entire page is a detailed, high-magnification microscopic image of neurons. The neurons are stained in shades of blue and white, showing their complex branching structures, including cell bodies (soma) and numerous dendrites and axons. The overall appearance is that of a dense neural network.

The Edmond and Lily Safra Center
for Brain Sciences

From Vision
to Impact



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Letter from the President The Hebrew University of Jerusalem

In the decade that has passed, the seedling that was planted here has grown to magnificence; its roots are solid, its branches far-reaching, and its fruit plentiful. Today, the Edmond and Lily Safra Center for Brain Sciences (ELSC) is one of the Hebrew University's crowning achievements, as showcased in the following pages. You are partners in this success; your friendship and support have nourished ELSC, enabling it to grow and flourish.



ELSC is, first and foremost, deeply rooted in the belief that interdisciplinary research is much larger than the sum of its parts. Today, ELSC comprises more than 30 interdisciplinary research groups, spanning the study of molecules, computational neuroscience, neurons, and cognition. ELSC researchers have created a truly collaborative scientific community, working together to unravel the mysteries of the human brain.

Since its inception, ELSC has grown into the world-class facilities of the stunning and iconic Suzanne and Charles Goodman Brain Sciences Building. Today, thanks to successful community outreach, ELSC has become an integral part of the city of Jerusalem and, in fact, Israel. And through the Jerusalem Brain Community it brings together a diversity of Hebrew University academics whose research touches upon the brain.

In addition, ELSC enjoys strong, collaborative ties with the global academic community, including partnerships with leading institutions worldwide. Through organizing the regional NeuroBridges program, ELSC researchers are able to advance brain science with colleagues near and far. These partnerships share excellence in research, discovery, and publications, employing the most advanced equipment available.

The fruit borne by ELSC has proven plentiful: the faculty and students' numerous scientific discoveries have appeared in hundreds of articles published in the most prestigious academic journals. ELSC's international Ph.D. program continues to attract top students from Israel and abroad. They are given generous support that enables them to participate in the global scientific community. The program's success is evident by the large number of ELSC alumni leading scientific research in first-rate laboratories worldwide.

Looking ahead, ELSC will grow, recruiting new, young faculty members; inaugurating an undergraduate degree program; and transforming into a world center for neuroscience education.

Ten years strong, ELSC is a source of pride for the entire Hebrew University community, and we could not have done it without your help. A decade from now, we will look back in amazement, as ELSC faculty and students continue to excel and provide answers to humanity's most mysterious questions – some of which we may not even be capable of formulating today.

Professor Asher Cohen

Message from the Rector The Hebrew University of Jerusalem

The 10th Anniversary of the Edmond and Lily Safra Center for Brain Sciences is an opportunity to evaluate what we have already achieved and to envision the future growth of the Center. Primarily, it is an occasion to express our gratitude to all the visionaries, scientists, administrators, students, and philanthropists, for their joint effort and shared goal of establishing and operating an internationally leading brain sciences research center, for the benefit of humanity.



ELSC is formed around the ideal of intensive interaction between various disciplines to enhance our understanding of thinking and other brain functions. The typical separation of our academic activity into different fields of knowledge is essential for practical reasons, mostly due to our limitations in gaining sufficient understanding of ideas. But this separation substantially hinders the development of knowledge. Our role as scholars and administrators is to continuously challenge these boundaries and to encourage interaction among scholars working in various scientific fields.

The interaction at the heart of ELSC is a substantial one. Insights from neuroscience and cognitive studies are essential for advancement in deep learning, and vice versa. For instance, in some important aspects human thinking is inferior to machine learning, while in others the human brain is superior to machine learning precisely because it lacks perfect recall and employs various heuristics. It is thus essential to better understand that what seem to be imperfections, cognitive biases and limitations of biological thinking, are in fact advantages, given the possibly different objectives of the two systems—the biological and the artificial. It might be that man's 'preeminence above a beast' is in fact the result of distinct optimization problems. ELSC, with its world leading scholars and thinkers, is designed to provide a meeting place to encourage such interdisciplinary interactions, which are essential for scientific progress.

ELSC has now concluded its formative years, with excellent scientific achievements. The Center is among the world's leading centers in brain sciences, with unique excellence in computational neuroscience. The Hebrew University of Jerusalem is remarkable for its academic achievements, and ELSC is the jewel in this crown. It is an exemplar for all units at the Hebrew University not only for its academic excellence but also for its remarkable team spirit, unique social outreach activities, state-of-the-art teaching and extraordinary success in nurturing future leading scientists and entrepreneurs. Simply put, both personally and in my capacity as Rector, I am proud of the men and women who comprise ELSC. I am confident that with the amazing financial support of our generous partners, ELSC will expand and make additional unique contributions such as the advancement of treatment of degenerative diseases, better understanding of the human brain and its interaction with machine learning, and much more. I express my appreciation and thanks to all members of the greater ELSC community and wish us all great success in the future!

Professor Barak Medina

From the Vice-President
for Advancement and External Relations
The Hebrew University of Jerusalem

According to the African Proverb, "It takes a village to raise a child". And indeed, it took a village to create the impressive research and teaching entity that is the Edmond and Lily Safra Center for Brain Sciences (ELSC). First the founding visionaries – scientists, fundraisers, and friends of the University who together envisioned a new kind of interdisciplinary scientific collaboration. They were soon joined by many donors and friends' organizations worldwide who were fascinated by the brain and intrigued by the possibilities. They held events and raised funds for labs and floors, and for faculty recruitment, and more. Joining them were the foundations that had faith that this Center would lead to important scientific breakthroughs in our understanding of the brain. All were vital members of the village that created ELSC.



Photo: Miriam Alster/Flash90

Today, we celebrate the end of the first decade of ELSC's journey. Mrs. Lily Safra and the Edmond J. Safra Philanthropic Foundation led the way, and the Crown and Goodman families soon joined in order to make possible ELSC's magnificent home, designed by Lord Norman Foster: The Suzanne and Charles Goodman Brain Sciences Building. In this home are some of the Hebrew University's most outstanding brain scientists, including new faculty members who arrived as the Center grew, as well as outstanding students who are part of ELSC's signature Ph.D. program.

We thank all of our friends and donors, who were vital in making this dream a reality and who continue to be crucial to its success. We invite you, our friends, to come and visit this wonderful Jerusalem landmark, and to meet with our scientists and students. And we look forward to the important and fascinating research that will continue to emerge from ELSC researchers, students, and alumni. May ELSC go from strength to strength.

Ambassador (Ret) Yossi Gal

Overview from the co-directors of ELSC

The Edmond and Lily Safra Center for Brain Sciences, ELSC, was established a decade ago. That event, back in 2009, was largely symbolic – and only today can we fully appreciate its significance. Looking back at the transformations ELSC underwent over the past ten years, we can truly value the process that led to its creation. Looking forward, we are eager to discover what the future will bring.



ELSC co-directors Professors Israel Nelken (left) and Adi Mizrahi

ELSC was the result of the vision of many. Since 1992, we had our small-scale but highly successful Interdisciplinary Center for Neural Computation, the ICNC. The secret to the success of the ICNC was in the space and time it provided to an interdisciplinary group of scientists and students for joint activities and interaction. It was the immense success of the ICNC that led to the initiation of a larger scale project by the University. The joint work of visionary scientists, Israeli as well as international, of the University's leadership, and of the Edmond J. Safra Philanthropic Foundation led to the establishment of ELSC in 2009.

ELSC has been up and running now for over 10 years. We have achieved a great deal in that time. One obvious achievement has been the Suzanne and Charles Goodman Brain Sciences Building: a state-of-the-art science facility that is also an aesthetic delight. Within its architectural splendor thrives the interdisciplinary community that characterizes ELSC. Every 6 months, when we summarize the 50 or so papers published during that time by ELSC members, we marvel at the number of joint publications within ELSC: cognitive neuroscientists with biologists, theoreticians with biologists, theoreticians with cognitive neuroscientists – all the combinations are there. Our achievements are widely recognized: ELSC members have received many prestigious grants and prizes. Importantly, great science is also being done today at ELSC by a new generation of young scientists. Furthermore, our teaching programs are expanding – our Ph.D. program continues to lead neuroscience education in Israel, and we have also started a brain science program for undergraduates. All of this has required the efforts of many friends and colleagues who we would like to acknowledge. We mention, in particular, Professor Eilon Vaadia, the founding director of ELSC, who led the effort from its outset and transferred the torch to us in 2017.

ELSC is now transitioning from adolescence to adulthood. We maintain the passion and energy to change the world, which characterize teenage years. At the same time, we take responsibility for our future as a mature center. At this period of transition, we plan to take advantage of our strengths and use them to drive us forward to new levels of excellence. We are proud of our past achievements and welcome the new challenges that we will face in the future. We intend to continue to do what we do best: produce great science that will serve as the basis for the work of the even greater scientists who will follow us. As the 2nd-century sage Rabbi Tarfon said, "It's not your destiny to finish the work, but neither are you allowed to desist from it" (Pirkei Avot). We are grateful to have had the opportunity to lead this wonderful endeavor, one link in a long chain.

Adi Mizrahi
Eric Roland Professor in Brain Sciences

Israel Nelken
Milton and Brindell Gottlieb Professor in Brain Sciences



Photo: Bruno Sharvit

Message from the Executive Director of ELSC

It gives me great pleasure to share this publication with you. In these pages, we can reflect on the remarkable achievements of ELSC since its inception and, most importantly, look forward to its future.

The last three years were extremely meaningful for ELSC as we settled in our new home, the Suzanne and Charles Goodman Brain Sciences Building. This remarkable building houses our research labs, an art gallery, conference facilities and three remarkable innovative expertise centers. Its social areas provide attractive physical spaces for interaction between faculty and students across the different labs and thus fulfill a guiding principle behind ELSC: the creation of a highly interactive interdisciplinary community that leads to better scientific research.



Our scientists' success is shown through many accomplishments. Their publication record is astonishing, with over 100 papers published in a year, many in the most prestigious journals. All this research is done in collaboration with teams of younger researchers, mostly from Israel but with an increasing number joining us from all over the world, creating a vibrant international community at ELSC.

Our growing international reputation is something we can all be proud of. Perhaps one measure of ELSC's success is the large number of prestigious grants that have been awarded, including 16 ERC and Synergy ERC grants. Our faculty members are also committed to teaching outstanding educational programs at every level throughout the University.

I am especially proud of ELSC's community outreach programs directed to the general public. ELSC's community, world-renowned researchers together with mid-career and new researchers and students, initiate and promote programs to make brain science accessible. Among these programs are "Beer and Brain" sessions, lectures, art and brain initiatives and mid-school and high school programs.

2020 was of course, a challenging year for us. Yet the ELSC community led many initiatives: volunteering to help with the national effort of processing COVID-19 tests and developing methods to make the process more efficient; delivering food and medications to the elderly; assisting high school students with their final exams; and providing online events that introduced Israeli and international communities to our outstanding scientists and their research.

I am proud to be a part of this dynamic institution. Sometimes dealing with the daily demands of helping to run this means I rarely pause and consider what a powerhouse of activity ELSC is.

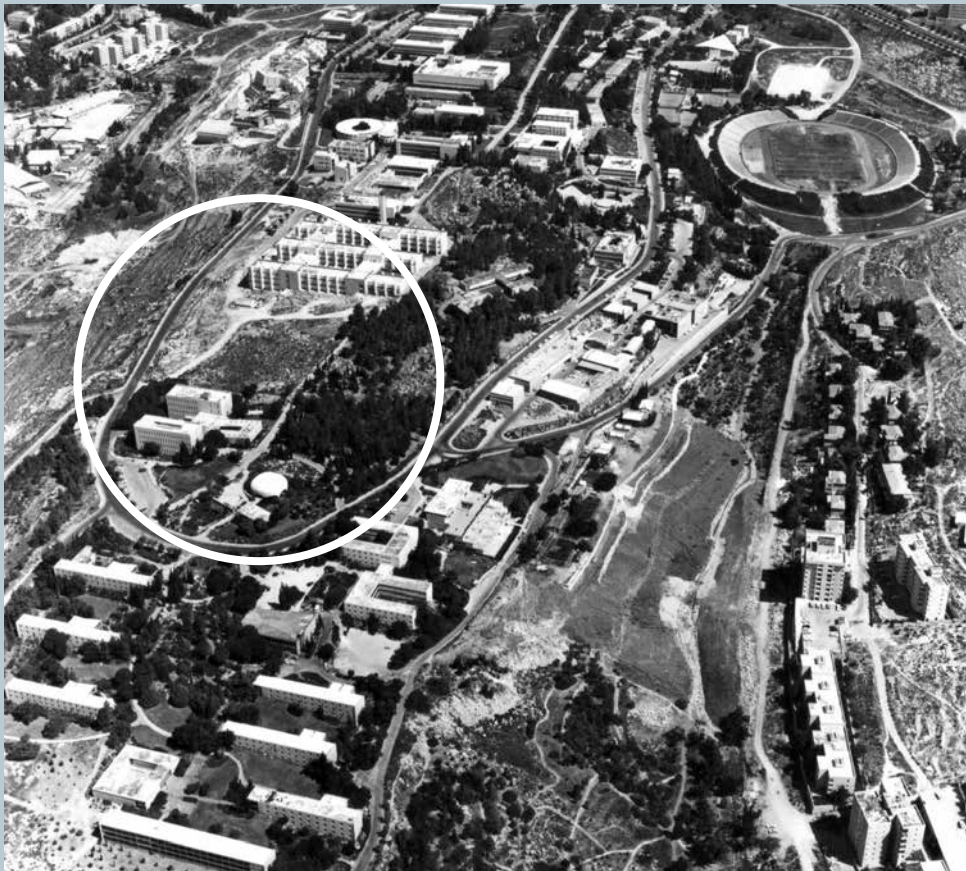
This is an opportunity to express my gratitude to everyone who helps make ELSC the success it is – its scientists and our wonderful staff. I especially thank the Hebrew University management for the trust and encouragement given to us. My gratitude also goes to the University's Division for Advancement and External Relations for their partnership in leading ELSC to excellence. And my deepest appreciation goes to ELSC supporters and friends – your partnership with us enables ELSC to conquer new heights and advance neuroscience in Israel and in the entire world.

Orit Ozana



ELSC Milestones

- 1992 *Interdisciplinary Center for Neural Computation is founded*
- 2006 *Fischbach Committee is established*
- 2009 *The Edmond and Lily Safra Center for Brain Sciences is established*
- 2011 *First faculty recruited to ELSC*
- 2015 *ELSC Ph.D. program goes international*
- 2017 *Inauguration of The Suzanne and Charles Goodman Brain Sciences Building*



The Edmond J. Safra campus, 1980, showing the future site of ELSC. Photo: Werner Braun

ELSC: FAQs

What is ELSC?

The Edmond and Lily Safra Center for Brain Sciences (ELSC) of The Hebrew University of Jerusalem (known as 'el-seck' to its friends), founded with the generous support of the Edmond J. Safra Philanthropic Foundation, is globally one of the leading institutes in neuroscience. It has, since its inception, been driven by a powerful interdisciplinary approach that brings together world-renowned scientists pursuing brain research from the different perspectives of theory, biology, and cognitive science.

ELSC is not only home to talented faculty members but also to outstanding doctoral students, many of whom study in its prestigious international Ph.D. program. Bringing such scholars together within cutting-edge laboratories in a single research institute has already enabled many significant breakthroughs, for example, in our understanding of brain function, the treatment of brain diseases, and the theoretical principles underpinning brain-inspired machines.

At ELSC we study the brain from various perspectives. Our theoretical neuroscientists develop theories of brain function that provide frameworks for understanding and later testing the computational role of neural circuits. Our cognitive research groups work on human behavior. They study the mysteries of vision, perception and consciousness. Other research groups study the actual cells and molecules of the brain; from basic functions of single cells to how different brain regions are coordinated during sensation, perception and action. Our researchers study both healthy and diseased brains.

Who works there?

Over 30 research teams work together within ELSC, implementing its unique interdisciplinary approach. They are led by world-renowned scientists from a broad range of disciplines, including anatomy, physiology, computer science, physics, and the cognitive sciences. Talented Israeli and international doctoral and postdoctoral students are vibrant members of these teams. Working in our labs are more than 100 students from ELSC programs and a similar number of students who come from various disciplines at the Hebrew University.

Why brain research?

The human brain is the source of our remarkable sensory, motor, emotional, and cognitive capabilities. ELSC is driving forward our understanding of the complex and multifaceted functioning of the brain. It is this understanding that will reveal the mechanisms involved in normal brain functions like learning, memory, and motor control. It will also promote our ability to find future therapeutic and preventative treatments for devastating brain disorders, such as Parkinson's disease, and Alzheimer's.

When did it all begin?

The origins of ELSC can be traced back to 30 years ago when, in 1992, the Hebrew University founded the Interdisciplinary Center for Neural Computation (ICNC) based on a vision of a group of Hebrew University researchers. These biologists and physicists, Professors Moshe Abeles, Hanoch Gutfreund, and Daniel Amit, foresaw the interdisciplinary nature of brain research. In 2006, following the success of ICNC, Professor Menachem Magidor, then President of the Hebrew University, established the Fischbach Committee – an international team of esteemed brain scientists led by Professor Gerald Fischbach. Their mission was to evaluate the state of neuroscience at the Hebrew University and to identify areas of opportunity for future growth.

The Fischbach Committee identified the potential of the Hebrew University to become one of the top five centers for brain research worldwide. It was decided to create a new institute to promote interdisciplinary brain research at the Hebrew University. This initiative was the result of the vision of the Edmond J. Safra Foundation and the Hebrew University, as well as senior members of ICNC, Professors Eilon Vaadia, Haim Sompolinsky, Naftali Tishby, and Idan Segev. ELSC was established in 2009. Professor Eilon Vaadia served as the founding Director of ELSC. Nobel laureate Professor Bert Sakmann was appointed the first chair of ELSC's steering committee, which included leading scientists whose areas of expertise cover the spectrum of disciplines relevant to the future of brain sciences.

Where is ELSC?

ELSC's new home, the Suzanne and Charles Goodman Brain Sciences Building on the Edmond J. Safra Campus of the Hebrew University, was inaugurated on June 13, 2017. It was a joyous and remarkable event as members of the Crown Goodman Family, who generously supported the construction of the building, celebrated with us on that day.

Designed by prize-winning British architect Lord Norman Foster, the building was described by Professor Menahem Ben-Sasson, Chancellor and former President (2009-2017) of the Hebrew University as: "the crown in an area that many people know: the Knesset, all government buildings, the National Library, the Supreme Court, and the Israel Museum."

How does ELSC achieve so much?

Outstanding faculty, talented students, modern new facilities, and state-of-the-art equipment – all are vital elements of building a vibrant world-class research center. **However, none of this can happen without the support of ELSC's visionary friends, supporters, and donors. Their contributions make the future possible.**

The Suzanne and Charles Goodman Brain Sciences Building

The Suzanne and Charles Goodman Brain Sciences Building, home to ELSC, was designed by Lord Norman Foster, the celebrated British architect. Completed in 2017, the building is located on a rocky outcrop of the towering south-west edge of the Hebrew University's Edmond J. Safra Campus.



Photo: Moy Volkovich



Photo: Yoram Aschheim

The façade of the impressive building is enveloped by a screen of gleaming metal filigree that traces neurons and the connections between them. The spacious Palm Beach Courtyard is lined with citrus trees flanking a water feature. The ground floor includes teaching facilities, the 200-seat Isaac and Luba Becker Auditorium, the Arditi Library, the Brandman and Gottlieb Cafeteria, and the Martine de Souza-Dassault Brain Art Gallery for the display of art inspired by brain science.



Photo: Harel Gilboa



Photo: Yoram Aschheim

A view of the beautiful city of Jerusalem can be seen from the third floor; a panoramic view that stretches out from the Florette and Henri Avram north wing to the Kenneth and Madeleine Ross south wing. Among the facilities the third floor houses is the Preclinical Biological Research Unit, donated by the estate of Ernst and Susanne Levy Guggenheimer. The Unit supports research in the areas of Parkinson's disease, brain-machine interface and movement and motor control.



Photo: Yoram Aschheim



Photo: Yoram Aschheim

The three upper levels house twenty-eight laboratories as well as the first floor social hub, donated by Masha and Victor Cohen, and the second floor social hub, donated by the Neufeld Family Memorial Fund of the Jewish Communal Fund of New York. The social hubs provide informal spaces for interaction and the exchange of ideas between students and faculty.



Photo: Yoram Aschheim



Photo: Bruno Charbit

The building was designed with careful consideration of environmental issues. It utilizes local Jerusalem stone wherever possible and is oriented on an east-west axis, optimizing natural cooling by the western breezes prevalent in Jerusalem, thereby reducing overall energy consumption.





Commemorative postage stamp issued by the Israel Post Company

On June 13, 2017, the Suzanne and Charles Goodman Brain Sciences Building was inaugurated by Mrs. Lily Safra in the presence of over 400 friends and supporters of the Edmond and Lily Safra Center for Brain Sciences. At the cutting of the ribbon, Mrs. Lily Safra was joined by (from left to right in the photo below): Lord Norman Foster, the architect of the Goodman Building; Michael I. Federmann, then Chairman of the Board of Governors of the Hebrew University; Nir Barkat, then Mayor of Jerusalem; and Professor Menahem Ben-Sasson, then President of the Hebrew University. As a tribute to this occasion, the Israel Post Company issued a commemorative postage stamp and a special postmark that was printed on all mail sent that day.



Photo: Michael Zekri

Faculty Spotlight

We are proud to introduce you to six members of the ELSC faculty. Their profiles give an overview of their work and provide an insight into the passion and dedication that make them world-class scientists.



Biological



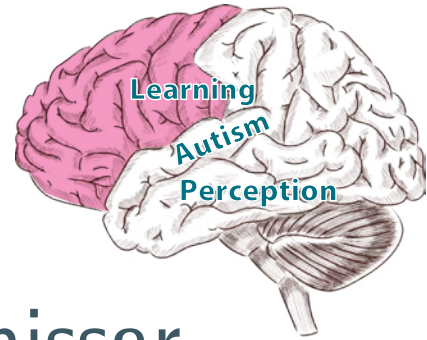
Theoretical



Cognitive

 Cognitive





Professor Merav Ahissar

The same basic question has fascinated Professor Merav Ahissar since her teenage years: how are perception and experience mediated by the brain? In her youth, the question, shaped by what she describes as her romantic nature, focused on the biological basis of love. As a scientist she has reframed the question and is now concerned with the essence of intelligence, specifically, the neural mechanisms underpinning learning, in both typically and atypically developing individuals, such as those experiencing dyslexia or autism.

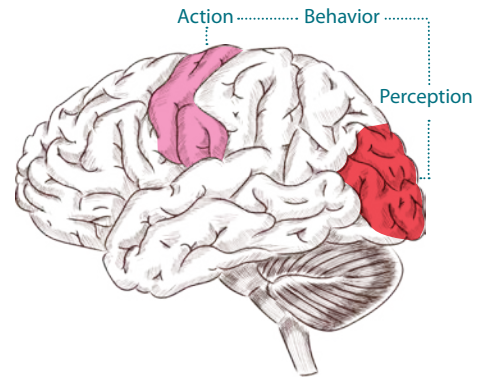
Professor Ahissar's research enabled her to develop three influential theories relating to the process of perceptual learning: the Reverse Hierarchy Theory (RHT), the Anchoring Deficit Hypothesis of dyslexia, and the Slow Updating Hypothesis of autism. RHT began as a theory relating to visual perception but has been extended to describe the underlying mechanisms operating when we learn through listening and has also recently been applied to the processes involved in language acquisition. The anchoring hypothesis has provided an essential framework for explaining the specific difficulties encountered by dyslexics. Updating has been developed in comparison to dyslexia. Individuals with autism are typically slow in changing plans and perceptual predictions, as opposed to the dynamics in dyslexia.

Professor Ahissar's education has reached across biology and computing science, with first degrees in both subjects, a master's in physiology, and a doctorate in neurobiology. She was the first biologist to be given a faculty position in the psychology department of the Hebrew University, where, since 2010, she has held the Joseph H. and Belle R. Braun Chair in Psychology. In the same year she became a full-time member of ELSC. Her lab is located in the Sikorsky Family north wing of the first floor, in the Goodman Building. To develop an understanding of the basic mechanism underlying complex human skills, Professor Ahissar collaborates with other groups in ELSC. She explains that: "Integrating different observations at different levels into a coherent picture is essential – as they all characterize the same brain. It is an enormous, utterly exciting challenge."

Professor Ahissar received several awards during her career, among them are the following: Klachky Prize for the Advancement of Frontiers in Science (2011); Michael Bruno Memorial Award (2006); Rector's Prize for Outstanding Researcher and Teacher (2005); Alon Fellowship for young lecturers (1997); Fulbright Postdoctoral Fellowship (1996); Feinberg Fellowship for post-doctoral studies (1994); Israel Organization of Women Academic Prize for Ph.D. students (1992).

 Biological





Dr. Lilach Avitan

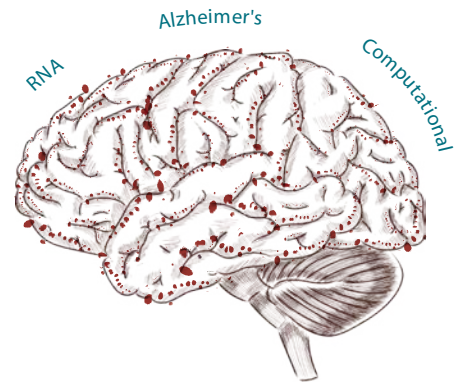
At 8 a.m. every morning Dr. Lilach Avitan is in her ELSC lab caring for her shoals of zebrafish. These glistening tropical fish and their young larvae provide her with a unique opportunity to study the relationship between behavior and brain activity. The transparency of these fish enables neural activity to be viewed non-invasively through a microscope. She explains that it is the only vertebrate where we can look directly at the neural activity of its entire brain at cellular resolution while simultaneously monitoring behavior. Moreover, the complex patterns of behavior displayed by zebrafish make it a useful model to understand the neural computation underlying behavior in other animals, even humans.

Dr. Avitan's research requires an elaborate set up that monitors every aspect of a fish's behavior (including tracking eye movements and ripples of tail and fins) while images shown to the fish on a movie screen are changed. All these variables are recorded synchronously with detailed observations of whole brain neural activity. The result is an enormous amount of data to be analyzed. Fortunately, Dr. Avitan has considerable expertise in computer science to draw on.

Her computer education began in the army where she was able to combine her military service with studying for a first degree in Computing Science and Statistics. After the army, she led an innovative startup company that developed a pioneering search engine, and then joined the Israeli telecommunications company Cellcom. But, hungry for new challenges, Dr. Avitan decided to leave the corporate world and do a doctorate in theoretical computational neuroscience. A postdoc at the Queensland Brain Institute in Australia unexpectedly resulted in her engaging with the experimental side of neuroscience and working with zebrafish. A year at Harvard in a leading zebrafish lab further prepared Dr. Avitan for her return to Israel in summer 2019, when she joined ELSC as an assistant professor. Here she set up a brand new experimental lab in the Claire Maratier north wing of the second floor of the Goodman Building, in which her computational skills are employed to analyze the data from her zebrafish experiments. A powerful combination that she hopes "will provide a mechanistic neural explanation for the animal behavior we observe." Among the awards received by Dr. Avitan are the Gloda Meir Fellowship (2019) and Superstar of STEM (2017).

 Biological





Dr. Naomi Habib

A new cutting-edge technology, called single-nucleus RNA sequencing, developed by neuroscientist Dr. Naomi Habib during her five years as a postdoctoral fellow at the Broad Institute of MIT and Harvard, has been a game-changer. It has enabled her lab at ELSC to adopt a completely novel approach in their study of Alzheimer's disease (AD). Using machine learning algorithms to analyze the data produced by this new molecular method, Dr. Habib's team has been able to identify, for the first time, a population of brain cells that look like they could be early drivers of AD. This population of cells, which they have named Disease-Associated Astrocytes, are now the focus of further research to clarify and chart their role in the progress of AD, with the possibility of them becoming a therapeutic target.

Recently, in collaboration with Professor Nir Friedman at the Hebrew University's Department of Life Sciences, Dr. Habib has adapted her single-nucleus RNA sequencing technology to develop a method for the diagnostic testing of COVID-19. This new test has many advantages over existing commercial kits: it uses materials that are readily produced in any lab rather than relying on expensive chemicals that are in short supply due to global demand; it provides a method of analyzing tens of thousands of patient samples within the same time that current methods can only manage a few hundred samples. There is an ongoing clinical trial with a thousand patients to confirm the earlier encouraging results already demonstrated by this test.

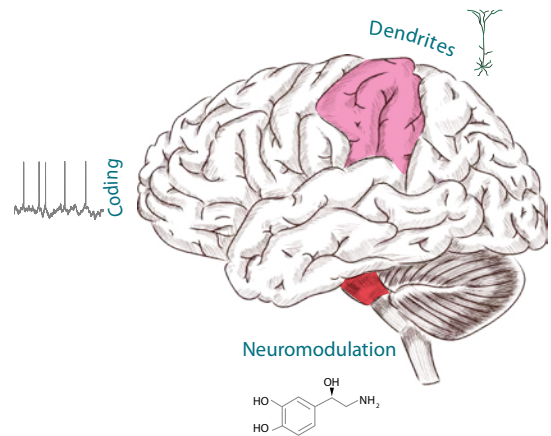
Dr. Habib, the Goren-Khazzam Lecturer in Brain Sciences, has a broad academic background in computational biology (the subject of her first two degrees and doctoral research at the Hebrew University) and a wealth of expertise in genome engineering and neuroscience. This powerful combination makes ELSC an ideal environment for her ground-breaking interdisciplinary research. Among Dr. Habib's awards are Howard Hughes Medical Institute (HHMI) Fellow of The Helen Hay Whitney Foundation, EMBO Long-Term Postdoctoral Fellowship, and Alon Fellowship.

 Biological

 Theoretical



Professor Michael London



A male mouse catches the whiff of a female – and courtship begins. The male woos his prospective mate with a series of elaborate ultrasonic vocalizations (outside the range of human hearing). For Professor Michael London this provides an ideal opportunity for an experimental set up that investigates the relationship between neural activity and behavior. Decoding the mouse language of love is just one approach utilized by Professor London's lab for deciphering the neural code that underlies the complex signals that are generated by neurons as they communicate with each other.

A combination of experimental and theoretical work enables Professor London to model the way neurons process information – both in response to stimuli and when generating output. For the mouse, information is received by sight, sound, and via its whiskers. Research by the London group into the neural activity following stimulation of these pathways has provided insights into signaling processes in neurons that are involved in many cognitive functions.

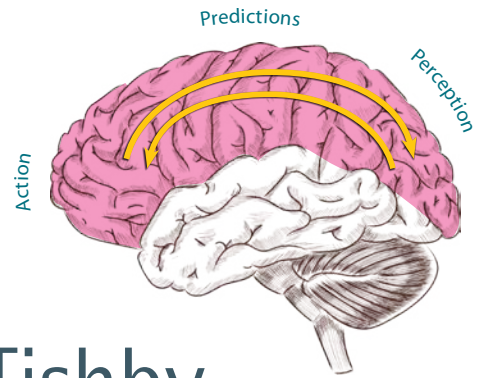
Professor London's lab is located at the Philippe and Catarina Amon south wing of the first floor. In collaboration with Professor Idan Segev, his lab utilized recent advances in the field of machine learning to show that neurons can be conceptualized as sophisticated input/output information processing units. The results of this work demonstrated that the neurons within the cortex of the brain are potentially more computationally powerful than had been previously assumed.

Driven, since teenage years, by a fascination of how the brain works, Professor London decided that he would gain useful skills by studying math and computer science, with psychology, as his first degree at the Hebrew University. Then a chance sighting of a poster outside the computer science building announcing the opening of the new ICNC computational neuroscience doctoral program led him to become one of the 20 students in its first intake. Following postdoctoral studies at University College London, he returned, in 2011, to ELSC as a member of faculty.

Professor London, the Sachs Family Lecturer in Brain Science, is not only dedicated to his research but is also passionate about teaching neuroscience at every level in the university, from undergraduates to postdocs. He says: "The only thing that is more exciting than interacting with the living brain is sharing this experience with your students."

 Theoretical





Professor Naftali Tishby

Professor Naftali Tishby, who holds the Ruth & Stan Flinkman Family Endowment Fund Chair in Brain Research, was a founding member of the Hebrew University's Interdisciplinary Center for Neural Computation (ICNC), the forerunner of ELSC. He works at the nexus of computer science, physics, and biology - developing powerful computational methods for analyzing biological data in the quest to understand the dynamic processes underlying the functioning of biological systems. His *information bottleneck* principle has led to the development of algorithms that can capture and quantify the complexity of many information-processing structures within biological brains as well artificial systems, including those involved with vision, auditory perception, and language. He has nurtured and mentored about 40 doctoral students during his career at the Hebrew University. Remarkably over 30 of them are now professors or leading researchers in prestigious institutions all over the world.

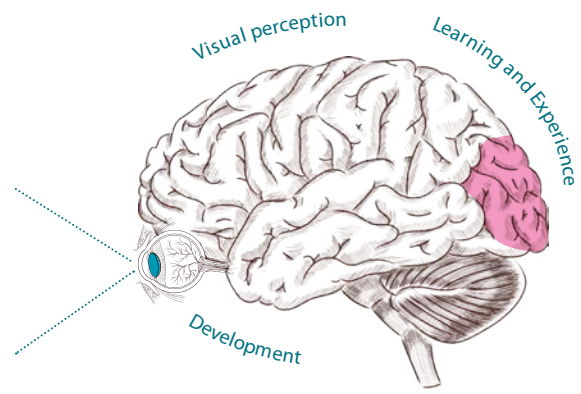
Since early childhood, Professor Tishby was on a trajectory to become a physicist and recalls how, at the age of nine years old, he was given an electric toy train. After two circuits round the track he had dismantled the locomotive and become fascinated by the workings of its motor. After a first degree in mathematics and physics, a master's in astrophysics followed - both studied while part of a special program offered by the IDF to exceptional high school graduates. After a doctorate in theoretical physics he spent the next six years in the US - one year as a postdoc at MIT and the rest at Bell Labs where he was among the first to work on machine learning, a field that would rapidly develop in importance over the next decades.

His return to Israel in 1991 brought him to the ICNC that later transformed into ELSC. Today he continues to work and teach a full program at the Hebrew University, finding a little time each day to play piano - an interest he has pursued most of his life, together with, of course, his passion for science.

Professor Tishby is the recipient of prestigious awards: The Israel Brain Technologies (IBT) Mathematical Neuroscience Award; Landau Prize in Computer Science (2016); PI, Intel Collaborative Research Institute in Computational Intelligence; incumbent of the Flinkman Family Chair in Brain Research (since 2010); IBM Faculty Award (2005, 2006, 2007); Alon Fellowship (1991); Chaim Weizman postdoctoral fellowship (1985); Eliyahu Golomb Israel's Security Award (1980).



Professor Ehud Zohary



Professor Zohary, who runs The Swiss Friends Vision Laboratory, does research focused on understanding how the brain processes visual information to make sense of visual input. Together with his students, he has previously shown that long-term blindness from birth dramatically alters the functional architecture of the human brain, in seemingly beneficial ways for the blind person. In recent years, his interest switched to studying the consequences of sight recovery after prolonged blindness. The classical case of restoring sight is via cataract surgery. While this is typically a disease affecting older people, it also occurs in newborns, albeit rarely. Typically, these infants are diagnosed and treated within the first year of life, and their vision develops almost normally. But in Africa, many of these cases go unnoticed, and they remain blind for the rest of their lives.

In 2013, Professor Zohary teamed up with an Israeli eye surgeon, Dr. Itay Ben Zion, setting up the 'Eye-opener' project to treat children in Ethiopia, and follow their recovery – mapping possible bottlenecks that prevent them achieving full visual understanding of the world. The team goes twice a year to Ethiopia – screening schools for children who are blind due to cataracts in both eyes, and then surgically treating them.

Classical studies have suggested that operating on these children, aged between 5 and 18 years old, may be of little help because many visual abilities can only develop during a critical period, in the first years of life. Professor Zohary's research has shown that despite their prolonged blindness, these children greatly benefit from surgery, and their overall visual abilities improve with time and are likely to improve further with training. This work not only gives hope to the millions of children worldwide with as yet untreated congenital cataracts but also extends our understanding of the plasticity of the brain.

Professor Zohary, who holds the Dr. G. Levi de Veali Chair in Neurobiology, describes his research of the past 10 years as a "truly integrated scientific and humanistic venture". In his early twenties, Professor Zohary had considered becoming a film director where he felt the visual and the emotional were intertwined. But this was lacking the element of scientific reasoning and analytical inquiry that also fascinated him. The 'Eye-opener' project embodies the unique combination he was looking for.

Professor Zohary is the recipient of several awards: Hilgard Award (2012–2013); 21st Century Science Initiative Award (2004); Golda Meir Award (1999); Ben Porat Presidential Award (1998); Alon Award (1995).

Our People

We are pleased to share with you a gallery of ELSC faculty, with their respective fields of research. The interdisciplinary nature of the ELSC community is immediately apparent. The diversity within our faculty is the source of our strength and success.



Dr. Yoav Adam
Neuronal electrical activity



Prof. Merav Ahissar
Human perceptual and cognitive learning



Dr. Lilach Avitan
The neural basis of behavior



Prof. Hagai Bergman
Computational physiology of the basal ganglia
The French Friends Laboratory for the Study of Parkinson's Disease



Prof. Alexander Binshtok
Pain plasticity



Prof. Yoram Burak
Computational neuroscience and biophysics



Prof. Ami Citri
Experience-dependent plasticity



Prof. Leon Deouell
Human cognitive
neuroscience



Prof. Inbal Goshen
Neurons and glia in memory
The Belgian Friends
Optogenetics Laboratory



Prof. Yosef Grodzinsky
Neurolinguistics



**Prof. Hanoch
Gutfreund**
Theoretical physics



Dr. Naomi Habib
Cognitive decline and
resilience



Prof. Shaul Hochstein
Vision research



Dr. Mati Joshua
The role of the basal
ganglia and cerebellum in
the control of movement



Prof. Leo Juskowicz
Computer-aided surgery
and medical image
processing



Prof. Chaya Kalcheim
Developmental
neurobiology



Prof. Yonatan Loewenstein
Computational neuroscience and computational cognition



Prof. Michael London
Biophysical properties of individual neurons and neuronal coding



Dr. Eran Lottem
Neural mechanisms of decision-making



Prof. Eran Meshorer
Epigenetics, stem cells, and neurons



Prof. Aviv Mezer
Human brain biophysics
The Belgian Friends
Laboratory for the Study of Neurodegenerative Diseases



Prof. Baruch Minke
Vision and pain



Prof. Adi Mizrahi
Plasticity of sensory systems



Prof. Israel Nelken
Auditory neurophysiology



Dr. David Omer
Neurophysiology of cognitive processes



Prof. Yifat Prut
Motor control



Prof. Idan Segev
Brain computation and communication
The Drahi Brain Computation and Communication Laboratory



Prof. Haim Sompolinsky
Neurophysics



Prof. Hermona Soreq
Neurogenetic aspects of the cholinergic system



Prof. Naftali Tishby
Computational neuroscience



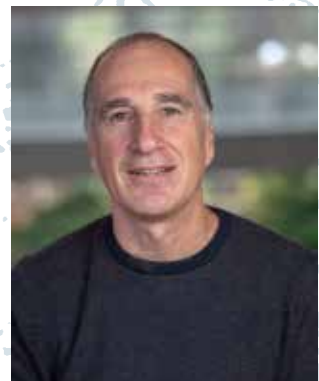
Prof. Eilon Vaadia
Brain sensorimotor functions



Prof. Yair Weiss
Human and machine vision



Prof. Yosef Yarom
Cerebellum



Prof. Ehud Zohary
Perception, memory and action
The Swiss Friends Vision Laboratory



Photo: Harel Gilboa

Expertise Centers

ELSC is home to three cutting-edge facilities: the Helmsley Brain Imaging Center, the ELSC Vector Core Facility (EVCF), and the fabrication lab (FabLab). These technological expertise centers support ELSC scientists and enable them to push forward the frontiers of brain research.

The Helmsley Brain Imaging Center

The Helmsley Brain Imaging Center, donated by The Leona M. and Harry B. Helmsley Charitable Trust, is at the heart of ELSC brain science research today. Home to two units, the ELSC Neuroimaging Unit and the more recent addition, the ELSC Core Microscopy Unit, the Helmsley Brain Imaging Center assists dozens of neuroscientists in their research.

ELSC Neuroimaging Unit (ENU)

ELSC's Neuroimaging Unit (ENU), that was generously supported by Max and Vera Deutsch and Dr. Josef Forgacz, provides state-of-the-art imaging services to over twenty-five labs from all the campuses of the Hebrew University and also serves labs at other universities. Exclusively dedicated to human brain research, this outstanding research facility, led by Dr. Yuval Porat, is operated by experienced radiology technicians, and employs a physicist, specializing in imaging techniques, to help researchers optimize their data collection.



Dr. Yuval Porat, head of the ENU, preparing a volunteer for an MRI scan



Dr. Yuval Porat discussing MRI scans

At the heart of the ENU is a sophisticated MRI scanner that allows scientists to study the human brain in action. The facility, currently housed at the Hi-Tech Village on the Edmond J. Safra Campus, also offers a variety of other equipment including physiological measurement tools, eye-tracking cameras, and a variety of devices that deliver auditory, visual, and tactile stimuli.

But the ENU is much more than a research hub, it fosters collaboration between the scientists using its facilities and initiates workshops and conferences to promote the exchange of ideas and knowledge in the field of human neuroimaging. Among its many other diverse activities, this unit gives tours and teaching sessions for university and high school students.

"The ENU was essential for our lab's research to be able to map behavioral and computational studies to specific brain regions in the neurotypical populations and in populations with dyslexia and with autism spectrum disorders."

Professor Merav Ahissar, ELSC

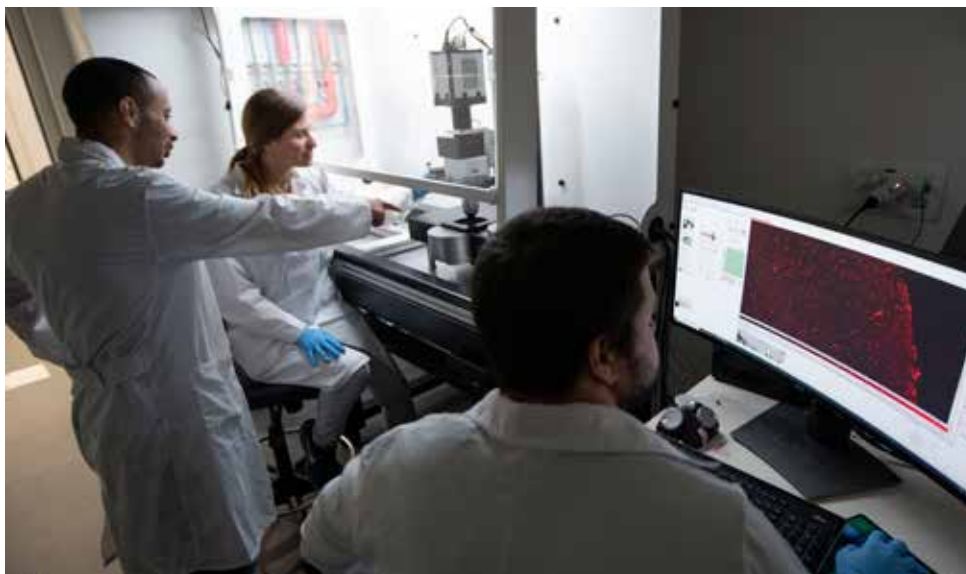


Dr. Nadav Yayon, head of the ECMU, with doctoral students

ELSC Core Microscopy Unit (ECMU)

The ELSC Core Microscopy Unit (ECMU) is a core imaging and microscopy facility. This unit has cutting-edge equipment that provides researchers with state-of-the-art imaging and microscopy techniques. Taking advantage of recent advances in technology, the unit, under the guidance of its manager Dr. Nadav Yayon, enables scientists to image the brain deeper, faster, and with higher resolution than ever before.

The unit occupies 144 m², divided into five microscopy rooms, a computer analysis suite, and an office space. It is located in the Pierre Falcone lower level of the Goodman Building. Students have both physical and remote access to the unit 24 hours a day, seven days a week. Data analysis is seamlessly done remotely, as the unit is equipped with a cutting edge remote desktop and an analysis server.



ELSC Vector Core Facility (EVCF)

The EVCF is a state-of-the-art core technology and research center for the design and manufacture of viral vectors. These are engineered specifically to support brain research in ELSC and in the wider research community throughout Israel, including at Tel Aviv University, the Technion, the Weizmann Institute, and the University of Haifa. This facility manufactures around 70 batches of viral vectors per year, continuously building a diverse collection of stock and tailor-made viral vectors that are employed in the rapidly evolving field of neuroscience.

"EVCF is one of the central pillars on which research at ELSC stands. Our capacity to rapidly evolve the research in our labs, using the most advanced tools available for systems neuroscience, is catalyzed exponentially by this professional, innovative and hard-working unit, led by Dr. Maya Sherman."

Professor Ami Citri, ELSC



Dr. Maya Sherman, head of the EVCF, in the lab



Fabrication Lab (FabLab)

The ELSC FabLab is a platform for designing and prototyping hardware solutions for neuroscience experiments. The workshop is equipped with advanced machines, such as 3D printers and computer-controlled cutting machines to 'sculpt' hard materials, enabling the manufacture of custom-made solutions from a wide range of materials.

The manager of the FabLab, industrial designer Itamar Frachtenberg, together with a mechanical technician, work closely with researchers to invent, design, and manufacture components required in their experiments. In this process, our researchers learn how to think creatively about solutions to challenges they face during experiments as the FabLab staff manufacture tools for them that have never existed before.

A Global Enterprise

ELSC participates in several collaborative ventures in brain sciences around the world. These programs enable a diverse and talented scientific community to work together on research projects, and provide opportunities for student exchange, and joint meetings. The synergy of these ventures provides a dynamic environment for enriching and accelerating research in neuroscience.

The France–Israel Center for Neural Computation

The France-Israel Center for Neural Computation (FICNC) was created in 2004 to promote collaborative research in neuroscience between the Hebrew University and their partners at the National Center of Scientific Research (CNRS) in France (at the Paris-Descartes University and at the University of Bordeaux).

FICNC generates tight scientific links between the partner institutions and more generally between French and Israeli scientists in brain research. FICNC scientific achievements have already translated into more than thirty publications in highly ranked international journals. Furthermore, the organization is committed to the training of a new generation of neuroscientists, both experimentalists and theoreticians.

FICNC is supported by CNRS, ELSC, the Medical and Health National Research Institute (INSERM, France), as well as by grants from the French National Research Agency.

Gatsby Program in Theoretical Neuroscience

The Gatsby Charitable Foundation's pioneering investment in theoretical and computational neuroscience began in the 1990s with the establishment of the Gatsby Computational Neuroscience Unit at University College London (UCL). Subsequently, the Foundation has expanded its investment by creating a Tri-Center alliance, between the Gatsby Unit at UCL, The Center for Theoretical Neuroscience at Columbia University, New York, and the Gatsby Program in Theoretical Neuroscience at ELSC. Over the last ten years, the three centers have organized joint meetings, research programs, and student exchanges. This collaboration has supported work that was published in more than 200 scientific publications. It has also sponsored close collaborations with experimentalists at each location and across the three universities.

In addition to regular postdoctoral fellowships, the program also provides special fellowships for outstanding junior researchers at senior postdoctoral level working on theoretical and computational neuroscience at the Hebrew University. The fellows not only pursue their own research but also actively participate in initiatives that strengthen Tri-Center interactions.

The Jülich Research Center (Germany)

This is one of the largest interdisciplinary research centers in Europe, and its Institute of Neuroscience and Medicine houses some of the most advanced and powerful magnetic resonance scanners in Europe. Since February 2019, several joint research projects have been established between ELSC and the Jülich Research Center.

The Max Planck Society (Germany)

In 2012 the Max Planck Society (Max-Planck-Gesellschaft) and the Hebrew University established the Max Planck-Hebrew University Center for Sensory Processing of the Brain in Action. The Center is sponsored on the German side by the Max Planck Institute of Neurobiology. Its direct partner in Israel is ELSC.

Researchers from both institutions cooperate on joint projects investigating the building blocks of the brain – its neuronal circuits. Their aim is to analyze the relationship between behavior and the processing of sensory information within the brain.

"The Center's outstanding team is ideally situated to tackle one of the greatest unresolved questions of the neurosciences: how sensory processing in the brain influences the behavior of animals and vice versa."

Professor Peter Gruss, former President, Max Planck Society

EPFL (Switzerland)

Cooperation between ELSC and the Brain and Mind Institute at EPFL (Ecole Polytechnique Fédérale de Lausanne) has resulted in eight research groups from the two institutions collaborating on a range of research projects. This has included joint research with the EPFL Blue Brain Project, which focuses on building biologically detailed digital reconstructions and simulations of the mouse brain. A recent success of this collaboration was the development of a brand-new tool to simplify complex neuron models.

Sainsbury Wellcome Centre (SWC) for Neural Circuits and Behaviour (UCL, UK)

In 2020, cooperation began between SWC and ELSC. Its goal has been to carry out collaborative scientific work between the two institutions and to work towards a deeper understanding of how the brain gives rise to behavior at the intersection of experiment and theory. The collaboration will be supported via annual colloquia, postdoctoral fellowships, and seed grants.



Study Programs

Graduate Program

ELSC's intensive doctoral program, 'Brain Sciences: Computation and Information Processing', is anchored in computational neuroscience and includes advanced courses in other disciplines, for example: physiology of the nervous system, theoretical and cognitive sciences, cognitive psychology, machine learning and information processing, and advanced research methods. Experiencing the various disciplines and gaining access to some of the world's leading brain researchers and their work, allow students to build their future-facing research paths. Indeed, over the years, more than a third of ELSC graduates have become independent researchers in various fields of neuroscience, at leading universities in Israel and throughout the world.

During their studies, students are provided generous scholarships and travel fellowships, available to them thanks to our devoted donors, and are encouraged to participate in international conferences and visit relevant research centers around the world.

"I studied physics as an undergraduate and I had to decide what to do next. Reading physics papers, I became convinced that the really interesting questions today are in biology in general and in neuroscience in particular. And when I was looking for a place where I could use the tools that I acquired as an undergraduate physics student to address these questions, I found our Ph.D. program. One thing led to another and today I am heading this program!"

Professor Yonatan Loewenstein, Head of the Ph.D. program

Postdoctoral Programs

Interdisciplinary Postdoctoral Program in Brain Sciences

ELSC's reputation for research excellence attracts international postdoc students who benefit from working with top researchers in state-of-the-art labs. This prestigious program provides local and international postdocs with generous scholarships for a period of two years at ELSC. The encounter of students from various places in the world allows for an interesting melting pot that gives ELSC its unique character as an international center.

Interdisciplinary Postdoctoral Program for Training Israeli Students Abroad

Through this program, ELSC awards fellowships to outstanding Israeli students, enabling them to advance their careers as brain scientists and to undertake postdoctoral study and research abroad, with the hope that many will come back to enrich ELSC and the Israeli neuroscience community.

Undergraduate Program

An interdisciplinary 'minor track' undergraduate program in computational neuroscience has been initiated at the Hebrew University by ELSC for honors undergraduates studying physics or computer science. There is high demand for this program and very few get accepted. This high-level program provides theoretical and practical knowledge for those students who wish to pursue graduate studies in brain science. Furthermore, it presents students with insights into the importance of an interdisciplinary approach in resolving complex scientific problems. The curriculum is composed of 22 mandatory courses in the fields of neurobiology, cognition, and computational neuroscience, and 10 elective courses in various fields that are related to brain research with a computational emphasis.

Summer Internships

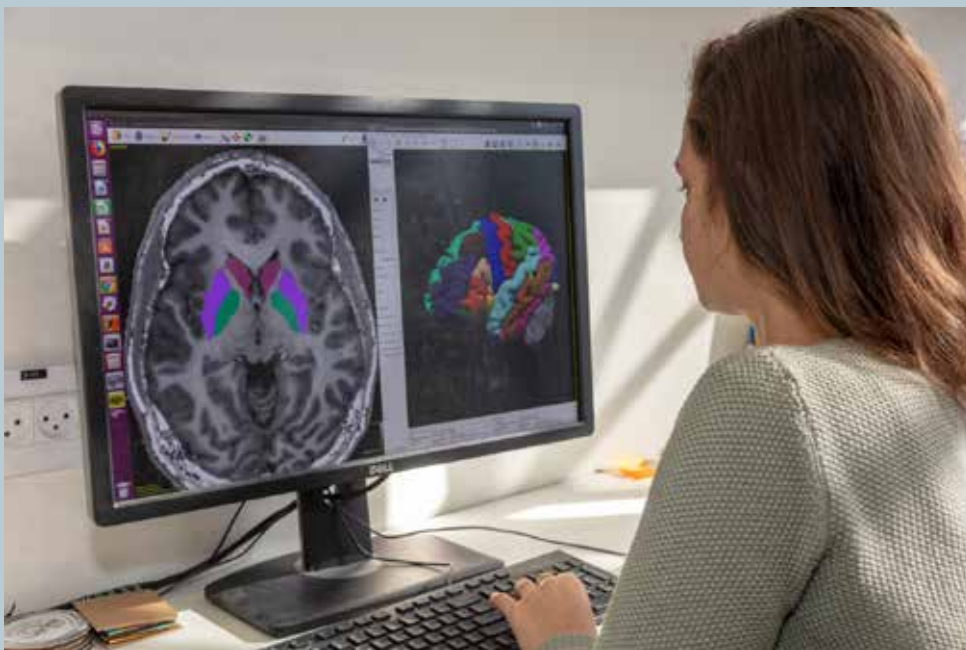
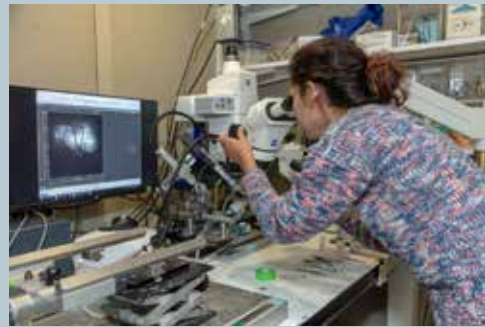
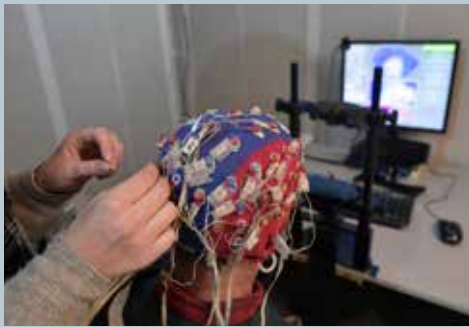
ELSC offers summer internships to top undergraduate students who are accepted to work in one of the ELSC research groups. The internship programs allow the students exposure to the labs and to the world of brain science, and the brightest interns later integrate into ELSC by joining one of the academic programs. For many of them it's a stepping stone that shapes their entire career.

Annual Retreat

ELSC's annual retreat is the highlight of the academic programs and both our faculty members and their students look forward to it each year. Since 2003, ELSC (then called ICNC) has organized an annual spring retreat in Kibbutz Ein Gedi. Here, in this lush oasis near the Dead Sea, postdoc and advanced Ph.D. students are given the opportunity to present their work and receive feedback from the ELSC community. The 3-day program covers the whole spectrum of brain research, including molecular, cellular, systems, cognitive and computational neuroscience, and includes both scientific and social activities.

Student Spotlight

ELSC doctoral students are an exceptional group of bright, dedicated young people that form part of a unique and dynamic international community at ELSC. Here is an opportunity to meet four of them.



Photos: Bruno Sharvit (upper left) and Moy Volkovich

Carmel Auerbach-Asch

Joined ELSC: 2015

"There are two stories from my life that I want to share, because they help explain how I chose my doctoral research topic 'Looking without Seeing', which I am studying in the lab of ELSC Professor Leon Deouell, where I study visual perception measuring electrical brain activity (EEG) together with eye-tracking.

My first-born son had just turned three-months-old as I started ELSC. After one of the first lessons in the course 'Brain, neurons, and everything in-between', I wrote him a letter that I have kept till this day, expressing both my tremendous love for him and the millions of questions I had about what he sees, what he understands, whether he has a sense of self, what he is aware of. These questions accompanied me silently during those first two years of intensive computational and biological training before I began my doctoral research.

I then encountered the question of conscious experience in a completely different, perhaps opposite, context. My father-in-law was diagnosed with a rare neuro-degenerative disease called corticobasal degeneration, which led to the total loss of motor capabilities and a deterioration in cognitive abilities, although it was clear to us all that he was consciously aware both of himself, his situation, and his surroundings. When verbal communication became difficult, he used simple eye-movement signals to help us understand him. That was when I wished I knew enough about the brain to record some type of brain signal and 'read' directly what he was trying to communicate to us. And now my research is devoted to a closely related topic.

...My journey in ELSC has revealed to me how computational skills, biological mechanisms, and cognitive theories are combined, under the hard and highly motivated work of outstanding researchers and devoted students. It has taught me to dream while confronting the data, explore but keep on track, and strive for success while enjoying the path."



Daniel Batyrev

Joined ELSC: 2016

When Daniel arrived in Jerusalem in 2014, he only expected to spend a year away from his family in Tübingen, Germany. He had completed a first degree in bioinformatics at the university in his hometown and was embarking on a one-year program of intensive Jewish study in Jerusalem at Machon Shlomo, a yeshiva (Jewish educational institution) dedicated to educating future leaders of Jewish communities.



Daniel, a Haredi (ultra-orthodox Jew) does not come from a religious family. His parents, typical of almost all Jews now living in Germany, originally came from the Soviet Union. They left Moscow for Germany in 1991 and Daniel was born there. With the suppression of religious practice during the Soviet period, his parents knew little about Judaism. For Daniel, his first contact came through his regular school, where he had classes in Judaism – religious classes being compulsory by law in all German schools with students opting for a particular religious denomination, or for general classes in ethics.

And so, began his "return" to an orthodox Jewish life. The one year at yeshiva in Jerusalem turned into two. But two years was the maximum period he could spend there, and he wanted to reconnect with his academic studies. Looking for the best program, "anywhere in the world", to pursue his interest in brain science, he felt that ELSC was the obvious choice. Daniel says that its reputation, and the rich variety of courses it offered students to give them a deeper and broader understanding of neuroscience, immediately attracted him.

His fascination with what makes the human brain so unique led him to join Professor Eran Meshorer's lab at ELSC to work on his doctorate, which has the working title: "Studying recent human evolutionary history using measured and reconstructed DNA methylation". Using human samples thousands of years old, Daniel will trace changes in human development through history by investigating the epigenetic marks that reveal which genes are switched on or off. He hopes that this research "will move us a little closer to answering the fundamental question: What makes us human?"

Arthur Berrou

Joined ELSC: 2017

After his first year of medical school at the university in his hometown in Brittany, Arthur Berrou entered a highly competitive national exam. His success made him one of an elite group of medical students in France who could transfer to the prestigious École Normale Supérieure in Paris and pursue an M.D.-Ph.D. program that combined his long-held interest in medicine and research.



Ever since he was a young child of nine years old, Arthur had wanted to be a doctor, but he also found science subjects intellectually exciting. He was determined to have both threads running through his life. The double-degree program in Paris gave him exactly that opportunity. During the first two years of this program he was able to study many aspects of neuroscience, and also met neuroscientist Dr. David Hansel, who as a co-director of the France-Israel Laboratory for Neural Computation (FICNC) divides his research between ELSC and the National Center of Scientific Research (CNRS), at the Paris-Descartes University.

Arthur became fascinated by the possibilities of applying mathematical modeling to the brain and decided to take a break from his medical studies to concentrate on doctoral studies in computational neuroscience. At the suggestion of Dr. Hansel, Arthur visited ELSC, met with faculty and students, and attended conferences, and "fell in love with the place." In 2019, following two years of studying computation and information processing at ELSC, Arthur began his doctoral studies on sensory encoding in the auditory system under the supervision of Professor Israel Nelken and Dr. David Hansel. He is the recipient of the 2020 Rector's Prize for excellent students.

After completing his doctorate, Arthur plans to return to his medical studies in Paris and to qualify as a neurosurgeon. He hopes to find practical applications for his theoretical work in neuroscience – perhaps developing devices that can help patients where their hearing impairment has a neurological origin. But, he explains, his future depends "on the opportunities life will give me."

Meanwhile he looks forward to the time he will spend at ELSC, which he describes as "the promised land for a budding neuroscientist", noting that it is here that he is being taught "how to do research at the highest level."

Kamini Sehrawat

Joined ELSC: 2015

"My family lives in New Delhi, India. My father is a cab driver at the Delhi International Airport and my mother is a housewife. We are four siblings. My younger sister is also in Israel, pursuing her Ph.D. in biochemistry at Weizmann Institute. My two elder brothers work in travel companies in New Delhi. Due to financial difficulties at home, I have had to work hard in order to get scholarships for my university studies.

I finished my first and second degrees in physics at the University of Delhi. During my studies, I was introduced to biophysics and complex biological systems, and I became increasingly curious about how the brain works and decided to pursue a Ph.D. in neuroscience. I applied to ELSC and fortunately got selected.

This is my third year of my doctoral studies, which I am pursuing in the lab of Professor Israel Nelken. The lab investigates auditory information processing in the mammalian brain. And the essence of my research is to identify music preferences in mice and to explore how such preferences take place in the mouse brain, and to better understand the underlying connectivity of the brain that gives rise to such behavior.

I live on campus in the university dormitories close to the ELSC building. The beauty of the campus has helped me a lot during the hard times of the COVID-19 lockdown. I like doing yoga and meditation on the grass, and walking around the campus.

I am now on a new journey of my life - both personally and professionally. This opportunity has given me the wings to fly high and fulfill my dreams. My goal is to do good science and help humanity. नमस्ते 🙏 (Namaste)"





Alumni Spotlight

ELSC takes enormous pride in the achievements of its alumni. Their paths after ELSC are varied and fascinating. Over 30% of our alumni pursue a career in academia. Four of our alumni are introduced in the next pages.

Dr. Galit Agmon

ICNC/ELSC: 2009–2018

When deciding what to study for her first degree, Dr. Galit Agmon found herself uncertain what to choose. She had diverse interests and was intrigued by many subjects. Linguistics was an obvious choice because of her interest in languages (she was already fluent in Hebrew, English, and Arabic), but she wanted to throw the intellectual net wider. Then she read on the Hebrew University website about the recently established department of cognitive sciences with its undergraduate program integrating topics from natural sciences, philosophy, and psychology. It was a perfect fit – a combined degree in cognitive science and linguistics.



While pursuing her first degree she took a computational course by ELSC (then ICNC) faculty member Professor Yonatan Loewenstein and found herself in a fascinating and totally unfamiliar field. "It was a very tough course," Agmon comments, "but I loved it". Her future academic path began to unfold. She ended up doing a doctorate in the field of cognitive linguistics with Professors Loewenstein and Grodzinsky as her supervisors. Her research was concerned with how the brain deals with negative concepts in language compared to positive ones.

Now Dr. Agmon has diversified her research and is doing postdoctoral research on natural speech at the Gonda Brain Research Center at Bar-Ilan University. Next year she will continue her postdoctoral studies at the University of Pennsylvania, where she will be working in a clinical setting applying linguistic analysis to the speech of patients suffering from neurodegenerative diseases – work that could ultimately have diagnostic implications.

A common thread throughout all Dr. Agmon's studies, has been a commitment to interdisciplinarity. And, of course, it was her time at ELSC that reinforced the enormous value such an approach can have. "It provided me with the opportunity to speak to very smart people from many disciplines. They constantly challenged my thinking and opened up new ways for me to think about how the brain works. It was very enriching and inspiring."

Professor Gal Chechik

ICNC: 1998–2003

Professor Chechik currently divides his time between the Gonda Research Center at Bar Ilan University and NVIDIA, where he is a director of AI (Artificial Intelligence) research, leading NVIDIA's research in Israel. His research focuses on machine learning and perception. Developments in this field, such



as Deep Learning, have been inspired by architecture of the brain. Like the brain, deep networks learn from examples by making many simple operations in parallel using a huge number of weak processors – as do the neurons of the brain. Also like the brain, these networks become useful when they are accelerated by highly parallel hardware. This interrelationship between brain and computer has long fascinated Professor Chechik. And he recalls that, as an undergraduate, he wanted to understand how an intelligent machine could be built based on the key principles underlying the functioning of the mammalian brain.

This profound interest made ICNC (the forerunner to ELSC) a natural home for Professor Chechik when embarking on his doctoral studies, with Professors Israel Nelken and Naftali Tishby as his supervisors. His research developed a method for analyzing the way the mammalian brain processes sound. Specifically, the auditory responses in a series of brain areas of cats that had been presented with natural sounds. Using information theory, and by comparing activity in different brain areas, he identified a coding principle taking place in the auditory system – where the identity of a sound is abstracted from information about the background sounds.

Today, Professor Chechik's research focuses on computational work, rather than biologically derived experimental data. But, he explains, it was his time at ICNC, working at the interface of complex biological systems and computing, that was formative and shaped his thinking about learning to extract meaning from raw data, which is the core problem faced by both developing brains and learning machines.

Dr. Neta Ravid Tannenbaum

ELSC: 2011–2017

Although now pursuing M.D. studies at the Technion, Dr. Ravid Tannenbaum confesses to spending much of her time doing research. Using the computational tools that she acquired during her doctoral research at ELSC, she is seeking to analyze all the data obtained from continuously monitoring patients while they are in the intensive care unit in a nearby hospital. Applying machine learning methods, Dr. Ravid Tannenbaum hopes to determine the physiological condition of a patient from the data, particularly picking up any significant changes.



At each stage of her education, Dr. Ravid Tannenbaum, carefully chose the subjects she studied to fulfill her scientific curiosity. For her first degree, this led to a combination of physics and biology, as she felt these subjects would give her a strong foundation for her growing interest in neuroscience. During her undergraduate years, she was enthralled by a lecture from Professor Haim Sompolinsky and decided to spend a semester working in the ELSC lab of Professor Yonatan Loewenstein on a computational project relating to cognition. Applying to ELSC for her doctoral studies seemed an obvious choice.

Although her doctorate focused on computational neuroscience, Dr. Ravid Tannenbaum explains: "At ELSC there is an openness and sharing of knowledge between different disciplines and I had the opportunity to learn about the clinical aspects of neuroscience. I realized that I have a deep interest in interacting with patients, and also in pursuing research within a clinical setting." She especially acknowledges the debt she owes to her doctoral supervisor at ELSC, Professor Yoram Burak, "who taught me all that I know about research and science."

Dr. Daniel Zoran

ICNC/ELSC: 2007–2013

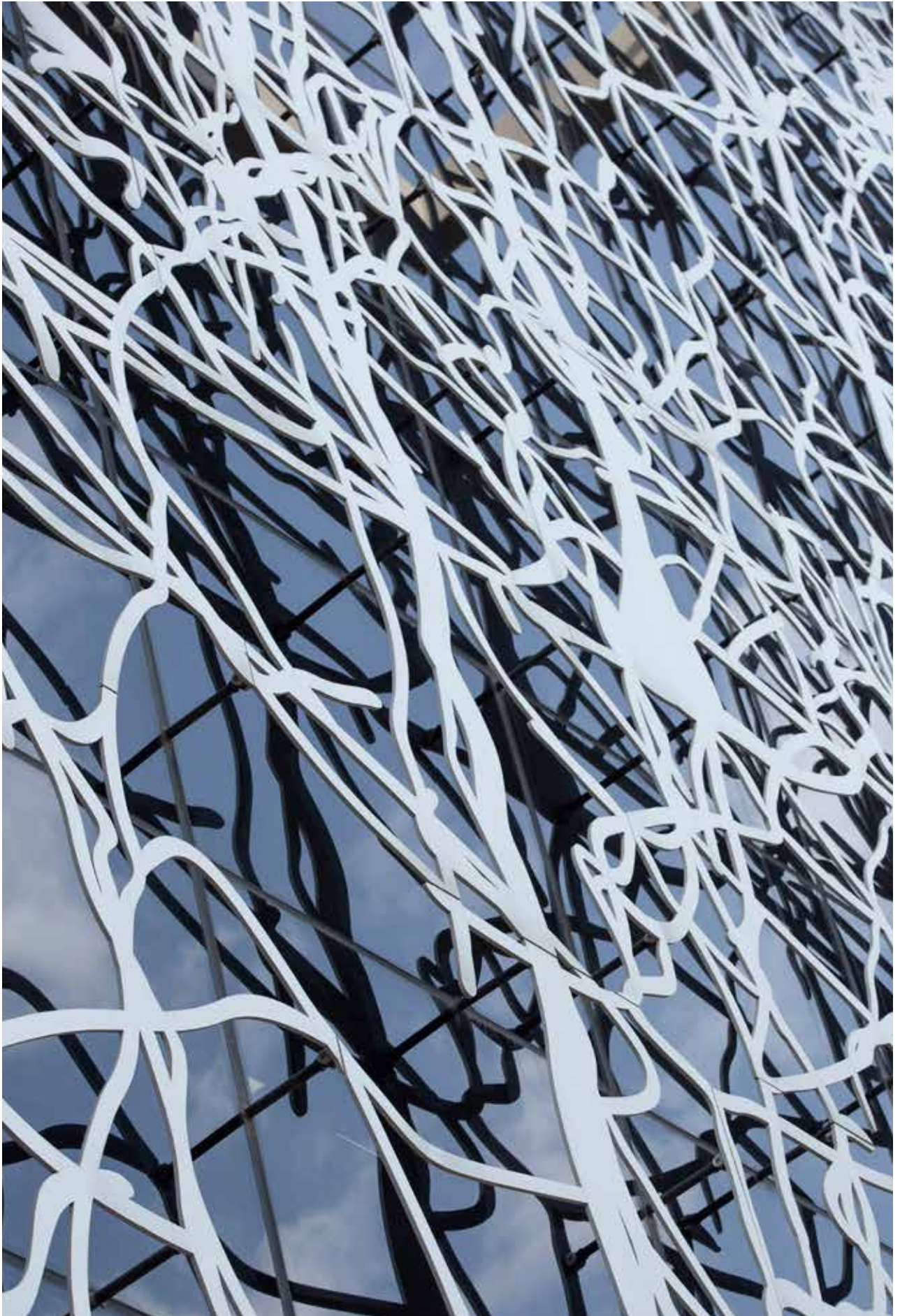
It was clear from a very young age that computer studies would be an important part of Dr. Zoran's life. Already as a nine-year-old, he was abandoning computer games in preference to learning computer programming, so that he could attempt to create his own games. With self-teaching books he was able to acquire several computer programming languages. Following high school, he spent four years in the IDF (Intelligence Core) as a full-time programmer and systems developer.



Today, Dr. Zoran is a research scientist at DeepMind, one of the world's leading AI research companies. His main research focus relates to computer vision, machine learning, and human perception. He has no doubt that: "the strong academic foundation I received at ELSC supports me to this day – there are many subjects, approaches, and ideas I would not have been exposed to had I studied somewhere else."

At the Hebrew University, his first degree was in physics and cognitive sciences, but he was able to incorporate courses on a wide range of other subjects. He opted for several courses given by members of the faculty of ELSC, for example: on artificial neural networks (computational models which attempt to reflect some of brain functions), image processing, and the application of statistical physics to machine and biological learning. He found lectures by Professor Yair Weiss on a computational approach to human vision especially fascinating and decided to pursue doctoral studies with him as his supervisor.

Dr. Zoran speaks enthusiastically about the three things he gained from his time at ELSC: "As a student at a top institute I was exposed to cutting-edge research; I could interact with leading researchers; and I studied with excellent students and colleagues."



Community Outreach

ELSC is committed to sharing its remarkable research achievements with both scientists and the general public. Through innovative programs, within Israel and internationally, ELSC offers diverse audiences a rich blend of cultural and scientific experiences. Our Art and Brain initiatives receive global recognition.

The Brain Circle

The Brain Circle (BC) is a unique ELSC initiative that brings together groups of enthusiastic friends and supporters who share the same dream of improving our understanding of the brain and developing cures for brain-related diseases.

BC members are also invited annually to exclusive weekend meetings in outstanding locations throughout the world, where they have the opportunity to talk to ELSC scientists about the latest developments in brain science research. World-renowned artists and scholars are also invited to these meetings. For example, recent BC events have been attended by Michal Rovner, Ron Arad, and Sir Antony Gormley.

During the pandemic, the Brain Circle met virtually when ELSC organized Webinars that brought them together with experts from ELSC and the global brain-research community.



HeadStart

Organized and sponsored by ELSC, HeadStart is a unique enrichment activity, that is designed to capture the interest of middle and high school students and encourage them to pursue studies in science. This lively and highly interactive program is conducted in a classroom setting and presented by ELSC faculty members and advanced students. Topics covered include brain anatomy, the activity of nerve cells, the functioning of the senses, and the methods used in brain research. This initiative started in 2015 and so far there were close to 100 in-person meetings and 5 Zoom meetings conducted in 38 different schools.

From Imagination to Reality

This program of one-day seminars introduces neuroscience to Jerusalem high school biology students. It is a joint initiative of the Jerusalem Education Administration and ELSC. The seminars, led by ELSC doctoral students, explore how science fiction is becoming a reality in brain research and present innovative technological developments and groundbreaking research. They provide the high school students with an opportunity to meet researchers, discuss their latest research, closely examine real brains of different animals, and even experiment with recording neuronal signals. ELSC is reaching out to a variety of schools from all sectors of Israeli society. Thus far, students from 23 different schools have participated in this program.

The Arts

In pursuit of its commitment to make the world of brain research accessible to the general public, ELSC has initiated several extraordinary collaborative ventures between neuroscientists and artists. The outstanding artistic creations generated are displayed in the Martine de Souza-Dassault Brain Art Gallery, in the Goodman Building, and in other locations throughout Israel (listed below under 'Exhibitions').

Concerts

ELSC hosts concert performances in the Isaac and Luba Becker Auditorium in the Goodman Building. These events, together with the exhibitions in the building's Martine de Souza-Dassault Brain Art Gallery, make ELSC a cultural hub for the general public, where neuroscience, art, and music interweave.



Art and Brain Week

A crowning achievement of the interactions at the interface of art and neuroscience is ELSC's diverse program for Art and Brain week.

Each year in mid-March over 100 countries participate in an extraordinary global event known as 'Brain Awareness Week'. Within each country a range of imaginative activities are presented to their local communities so that they can share in the wonders of the brain and the impact brain science has on our everyday lives.

In Israel, for the past ten years, ELSC has been involved with this event and has collaborated with the Jerusalem Cinematheque and other cultural institutions in Jerusalem to produce a unique week-long program of events known as 'Art and Brain Week'. Focused on promoting the public understanding of the progress and benefits of brain research, it has enabled thousands of people to experience cultural events through the prism of brain science.



The week always has an exciting blend of scientific and cultural events. Talks from ELSC scientists are woven into a program that has, in the past, included comedy performances, food tasting, films, theater, music, and art exhibitions. Art and Brain Week does much to establish bonds between the general public and academia and raises awareness of the importance of brain research. In 2016 ELSC's program of events received a prize for the best Brain Awareness Week event in the world. The prize was awarded at the prestigious annual conference of the Federation of European Neuroscience Societies (FENS).

Exhibitions

ELSC exhibitions are projects resulting from the highly innovative interactions between neuroscientists and artists. Most of the time the artists and scientists were strangers to one another prior to working together on this initiative, believing that they exist in different spheres. These collaborations made them realize that the concepts they are working on are sometimes very similar. The exhibitions represent the learning process that both the artist and the scientist went through together and separately. Examples of the output generated through these unique collaborations are shown here. These exhibitions were curated by the University Curator, Michal Mor.



Braintoons

Under the auspices of ELSC, Israel's leading animators and cartoonists attended a lecture, in 2013, on the innovative approaches utilized in brain research given by Professor Eilon Vaadia, then Director of ELSC. The artists' interpretations resulted in a collection of distinct creations, including comic strips and individual caricatures that were exhibited in public spaces in Jerusalem and Tel Aviv.



Art: Guy Morad

Game of Lobes

In 2014, one of Israel's pre-eminent hubs for promoting the art of cinema, the Jerusalem Cinematheque, hosted an exhibition by Israeli caricaturists inspired by a collaboration between ELSC and the Association of Cartoonists. The works provided a glimpse into the workings of the brain with touches of imagination and humor.



iPhasia

iPhasia was an especially poignant exhibition, displaying the photographs taken on an iPhone by Eyal Peled, a famous TV personality in Israel, who had suffered a major stroke in 2008 that left him partially paralyzed and with aphasia, the inability to speak. This extremely popular exhibition of Peled's very personal view of the world, was launched at the Jerusalem Cinematheque during Art and Brain Week in 2015 and seen in several locations throughout Israel.



Photo: Youval Hai

Between Synapses

For almost a year, a group of artists were paired with ELSC brain scientists from disciplines such as vision, cognition, movement, hearing, and memory. Together, they held research meetings and collaborative sessions that culminated in an exhibition of artworks displayed, in 2016, at the Artists House - a gallery housed in the 19th-century Bezalel Art School building in central Jerusalem.

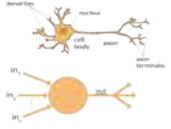
Brain Sciences: Not Child's Play


For one evening in 2017, students and researchers came together with well-known Israeli mixed-media artist, Hanoch Piven. By means of collage and assemblage of ready-made materials, the participants created artworks inspired by their research. A unique melding of the creativity of brain scientists and artists hosted by the Jerusalem Cinematheque.

חשיבות עקבית היא תחום שבו מתורגמת הפעילות המוחית לנוסחאות מתמטיות. כל תא במוח מקבל מידע, מעבד אותו ומעביר אותו לתא אחר. תהליך זה ניתן לייצג באמצעות נוסחאות אחת הנוסחאות הבסיסיות, המתארות קליטה, עיבוד ושליחה של אינפורמציה נקראת "פרספטרון".

כל תלמידי ELSC יודעים מהו פרספטרון, גם אם יעירו אותם בארבע לפנות בוקר...

ELSC + Perception = ELSCTRON





Potential Action

Curators Michal Mor and Alona Shani-Narkiss compiled, in 2018, nine posters, that paired architectural elements from the Suzanne and Charles Goodman Brain Sciences Building, which was then in the process of construction, with images of the brain produced by MRI and by different types of microscope.

Evolution and Theory by Zadok Ben-David

Exhibited in the ELSC building in 2019, a screen encapsulating the 'Evolution and Theory' series of 250 hand-cut sheet-aluminum sculptures by internationally celebrated Israeli artist Zadok Ben-David. Largely inspired by late nineteenth-century scientific illustrations, this work has been displayed throughout the world. The screen was placed in the Goodman Building as part of the first international conference (entitled 'What Makes Us Human?') held there.



Photo: Harel Gilboa



Photo: Youval Hai

Retinopathy by Ayelet Carmi

An exhibition focusing on the discrepancies between sensory input and the deciphering of reality opened in January 2020, in the Martine de Souza-Dassault Brain Art Gallery in the Goodman Building. It was a collaboration between artist Ayelet Carmi and Dr. Ayelet McKyton, a neuroscientist whose research explores the limitations of relearning to see after experiencing blindness from birth. Her initial study, which was conducted in Ethiopia in collaboration with ELSC Professor Ehud Zohary's laboratory, monitored children's sight following cataract surgery. Carmi's drawings reveal the ambivalence that ensues when proper visual input is not, or cannot, be interpreted clearly.



Photo: Youval Hai

Forums for Researchers

The Heller Lecture Series

Each year this unique lecture series brings to the Hebrew University several of the world's most celebrated researchers working in the field of brain science. The speakers spend a week at the University and deliver two talks – a lecture for the general public and a technical presentation at the weekly ELSC seminar.

Generously funded by the Michael and Morven Heller Charitable Foundation, the Heller Lecture Series was initiated in 2002, under the auspices of the Interdisciplinary Center for Neural Computation (ICNC), which has since merged into ELSC. With distinguished speakers, including the Nobel laureates Professors Edvard Moser and Bert Sakmann, it has rapidly become one of the most prestigious lecture series at the Hebrew University.

In a field where women are underrepresented, especially at the upper academic echelons, ELSC Professor Inbal Goshen saw the opportunity this lecture series provides to help younger women scientists to aspire to break through the proverbial glass ceiling. Some of these prestigious lectures are given by leading women scientists from all over the world, and after their lectures Professor Goshen set up a women's forum. Here there is general discussion on the particular challenges women scientists continue to face and how some of these difficulties can be negotiated.

NeuroBridges

NeuroBridges is an annual program bringing together graduate students and postdocs, primarily (but not only) from the Middle East and Mediterranean region. Its main goal is to provide a forum for scientific exchange, academic interaction, and mutual understanding between young scientists across these regions. Its events, hosted in Europe, have brought together participants from across the region and beyond, including from Egypt, Jordan, Iran, Israel, Lebanon, Morocco, the Palestinian Territories, Syria, and Turkey, as well as from China, Europe, and the United States.

The program is co-organized by Dr. Ahmed El Hady (Princeton Neuroscience Institute, USA), Professor Yonatan Loewenstein (ELSC), and Dr. David Hansel (CNRS, Paris, France), and is partly supported by ELSC.

Brainy Days in Jerusalem

This biennial 'interdisciplinary celebration' is an extraordinary event that brings together leading scientists in every field related to brain research, from all over the world, for a three-day conference in Jerusalem. During the conference, the scientists present their cutting-edge research and exchange ideas that lead to new multidisciplinary collaborations.



Coursera

In 2013, the Hebrew University offered its first online teaching course in collaboration with Coursera, a worldwide online learning platform that partners with leading universities throughout the world. The course, given by ELSC faculty member, Idan Segev, the David and Inez Myers Professor in Computational Neuroscience, entitled 'Synapses, Neurons, and Brains', attracts around 50,000 students a year. The students come from all over the world including Lebanon, Saudi Arabia, Malaysia, Iran, and Pakistan.

The Jerusalem Brain Community (JBC)

The Jerusalem Brain Community (JBC) is an association of faculty and students from across the entire University who are interested in the brain. JBC members come from diverse disciplines, including the life sciences, medicine, psychology, agriculture, and musicology. Founded through the generous support of the Edmond J. Safra Philanthropic Foundation, it aims to promote brain research at the Hebrew University.

The JBC provides support for postdoctoral fellowships, doctoral fellowships, the JBC 'Golden Opportunity' Scholarships for undergraduate students, travel grants to attend scientific meetings abroad, the JBC Travel Exchange Program for PIs and students, the JBC SMART Brain Prize for a selected monthly article, and JBC organized symposia.

The JBC is also engaged in professional and social activities, promoting greater awareness of developments in brain research by supporting symposia and workshops. Some workshops are exclusively organized by students and include international invitees so that young researchers can engage with top scientists in their field. Each year, since 2014, the JBC has also organized an annual retreat for the exchange of ideas among our members. These events have always been a great success, attracting over 100 scientists and students.

The JBC has also organized community outreach activities. Perhaps the one that stands out is the series of 'Brain and Beer' events. At these meetings, held in an informal atmosphere over a glass of beer, ELSC students gave short lectures and discussed their research with the public.



Activities during the COVID-19 Pandemic

ELSC's highest priority during the COVID-19 pandemic has been maintaining the health of students, faculty, and staff. Following the guidelines from the Israeli Ministry of Health, ELSC opened the second semester of the 2019-2020 academic year in March 2020 with online teaching and a reduction in research activities. Experimental labs were semi-open, but theoretical teams continued to be active from home. This period enabled researchers to analyze results and write research papers, thus ensuring the continuance of scientific output.

A few ELSC scientists moved away from their ongoing work and initiated research related to COVID-19. At the forefront, Dr. Naomi Habib and Professor Eran Meshorer (in collaboration with other HUJI scientists) worked to improve the detection test for the virus, making it faster and cheaper. In addition, four of our advanced doctoral students published a paper that offered computational tools to increase the efficiency of COVID-19 testing. The strategies they developed provided a significant reduction in the amount of equipment and time needed to test large numbers of samples.

ELSC researchers also assisted with the national effort to examine as many coronavirus tests as possible – working on their ELSC research during the day, and at night volunteering at the Hadassah Medical Center. One of the volunteers, Dr. Maya Sherman, director of the ELSC Vector Core Facility, utilized her background in molecular biology to contribute to the important work at the corona testing facility set up at Hadassah.

Maintaining its commitment to providing activities that reach out to the widest possible audiences, ELSC initiated an online lecture series on recent discoveries in the brain sciences – 'Brain-Zoom'. With an audience of hundreds for each lecture, this popular series included topics such as memory improvement, brain simulation, brain-machine interface, machine learning, and the musical brain.

During these difficult times, ELSC has also been able to show how it can function as a caring community. For example, during the holiday of Passover, when all Israel was in lockdown, our international students were confined to their apartments or dormitories in Jerusalem. ELSC made sure that each student had a hot meal every day during the holiday. Additionally, ELSC staff, faculty, and students set up a group of volunteers to assist the Ministry dealing with social welfare and helped senior citizens in Jerusalem with food and medication, and also ran errands for them. This volunteer group quickly expanded to include the larger Hebrew University community.

The 2020-2021 academic year opened in October 2020, also online due to COVID-19 restrictions. Students who were with us during the previous semester were familiar with the online learning routine but our 17 new graduate students, who started their journey with us this year, needed to adapt. On orientation day, prior to the start of the new academic year, we were unable to greet our new students in person as we normally do each year. Instead, we brought them together online. Located in their homes in Israel, India, Germany, and Bulgaria, the students met virtually their new professors and ELSC administrative staff. And this year, there were also 34 undergraduate students from the Minor Track program to welcome - more than double the number we had last year. We do hope to see many of them in our graduate program in the future.

Undeterred by the difficulties posed by COVID-19, ELSC continued to develop innovative programs. One of them was a new series of lectures, entitled 'Diseases and Health of the Brain'. Brain specialists and neurosurgeons at the Shaare Zedek Medical Center in Jerusalem led this course. Throughout these lectures, complex clinical cases were discussed - identifying the challenges they present and focusing on recent developments in understanding and treatment. One of the aims of this program was to introduce ELSC scientists to the complexity of clinical and surgical approaches to brain disease, in the hope of creating future collaborations that might lead to successful outcomes. Over a hundred people followed this course: Ph.D. students, postdoctoral fellows, as well as faculty members.

Professor Idan Segev, Principal Investigator of the Drahi Brain Computation and Communication Laboratory and one of the initiators of the course, said: "It is key that active physicians interact with us. We need to be educated about the most recent advances in brain-related diagnostics and treatments for stroke, headaches, tumors, movement disorders, etc. In turn, physicians should make use of modern big data and computational/machine-learning methods - an expertise of ELSC. This exchange of knowledge will lead to new diagnostic and innovative treatments for many devastating brain diseases."

Horizons: The Road Ahead

Over the next five years we will use ELSC's strengths to advance our understanding of healthy and diseased brains, bridging the gap between basic science and treatment.



Three fundamental research targets

Artificial and biological intelligence

Recent advances in the field of Artificial Intelligence (AI) have revolutionized society. Nevertheless, current AI is still a poor imitation of human intelligence in terms of flexibility, depth, breadth, and speed of learning. ELSC researchers will develop a theoretical understanding of AI, test its similarities and differences from brain function.

Minds in bodies

Minds and bodies seem to exist in very different realms yet are inseparable. We will study the mind-body problem by revealing the underlying biological foundations of perception. We will develop novel approaches for treating disorders of perception and awareness - from alleviating sensory impairments to novel treatments for schizophrenia, stroke, and dementia.

From decision to action

Our remarkable ability to move in space is superior to any existing robotic system. The complexity of the motor system and the computations it carries out are further revealed when the system is impaired (e.g., in Parkinson's disease or spinal cord injury). ELSC researchers will study how the brain controls movement, and reverse-engineer the processes to alleviate motor impairments.

Building on our core strengths

Our unique collaborative ethos

We will develop larger-scale research themes within ELSC, initiate seed-grant programs, and prioritize recruitment.

Centralizing research activities

We will develop a model of centralized technical and administrative support for research at ELSC, including state-of-the-art research facilities within the Goodman Building.

Our educational programs

We will refocus our Ph.D. program, and extend our teaching at the undergraduate level. We will set up an international visitor program for short-term visits of leading scientists.

Nurturing technical expertise

The acquisition and maintenance of modern research techniques require an accumulation, over years of experience, of ever-changing knowledge and expertise. The difficulty of maintaining coherent, innovative, long-term professional technical knowledge has been recognized all over the world as a major challenge to achieving excellent research. ELSC has highly successful centers of expertise led by experts in their fields: the Helmsley Brain Imaging Center that includes the **ELSC Neuroimaging Unit (ENU)** and the **ELSC Core Microscopy Unit (ECMU)**, and the ELSC Vector Core Facility (EVCF). We also have a fabrication lab, the **FabLab**, and a **big data and high-performance computing unit** allowing ELSC members state-of-the-art services. We plan on expanding the services to provide, for example, a technology unit for real and virtual behavioral environments, a technology unit for large-scale dense recordings, and an upgraded neuroimaging unit.

Interfacing with the rest of the world

Worldwide collaborative projects

ELSC looks forward to ongoing fruitful collaborations with brain research institutions outside Israel. For example, we are part of an International Research Network (IRN) with the CNRS, France; we support binational postdoctoral fellowships in collaboration with scientists at the Sainsbury-Wellcome Center (SWC) in London, UK; we have a collaborative project with the Hemholtz Center at Jülich, Germany; and are part of a multi-center collaboration with UCL, London, UK, and Columbia University, NY, USA.

High-tech

ELSC recognizes the importance of promoting relationships between its researchers and the world of high-tech. ELSC researchers are actively working with high-tech companies developing the next generation of brain-related technology, from brain-machine interfaces to novel techniques in artificial intelligence. And our links with hi-tech are reinforced by the large number of ELSC alumni who have gone on to become leaders in today's high-tech, in startup companies, as well as in established companies such as IBM, Google, DeepMind, and Nvidia.

BioMed

ELSC will continue to promote connections with clinical research through collaborations with hospitals and with the biomedical industry. ELSC researchers are already successfully engaged in developing, for example, novel products for the pharmaceutical industry, advanced medical devices for brain surgery, and novel means for identifying brain diseases through MRI scans.



Going Forward Together

In this report we have shared with you an overview of the ELSC community - the talent and commitment of our faculty and students. We have given you a glimpse into some of our state-of-the-art facilities and our innovative bridge-building between our scientists and the wider public. We have looked back at the path taken...but our focus is on the future: a future that we will journey toward together.

ELSC owes a great debt of gratitude to our friends, supporters, and donors all over the world. You have made the dream of advancing brain sciences through an international interdisciplinary center in Jerusalem a reality. With your support and vision, we will be able to continue our quest to solve the mysteries of the brain and, ultimately, to improve the well-being of humanity.

*"Today's basic science is tomorrow's technology.
What we at ELSC develop and discover today is
destined to transform tomorrow's society."*

Israel Nelken, Milton and Brindell Gottlieb Professor in Brain Sciences
Co-director, The Edmond and Lily Safra Center for Brain Sciences

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