**Shani Stern, Ph.D.**

Principal Investigator

Sagol Department of Neurobiology

Faculty of Natural Sciences

University of Haifa, Israel

**Curriculum Vitae**

**Education**

* Sep 2015-2019: **Postdoctoral fellow**, **The Salk Institute for Biological studies**

Postdoctoral fellow in the lab of Prof. Fred (Rusty) Gage (the president of the Salk Institute). I studied the cellular mechanisms underlying a few psychiatric disorders and Parkinson’s disease using patient-derived neurons with induced pluripotent stem cell (iPSC) technology along with computational models that described the neurophysiology of these neurons. I used whole-cell patch-clamp, biophysical, and genetic assays to unravel mechanisms underlying physiological changes of neurons derived from bipolar disorder and schizophrenia patients. Using machine learning, I classified subtypes of the bipolar disorder and predicted with a low error rate the response of the patient to lithium treatment. I was involved in the research of a few specific mutations that cause intellectual disability, autism and epilepsy.

* 2011-2015: **Ph.D.** **Physics** of Complex Systems department at the Weizmann Institute of Science in the lab of Prof. Elisha Moses with close collaboration with Prof. Menahem Segal from the Neurobiology department. Thesis title: “Ion channels and excitation of neuronal networks in health and disease”. I received the Menashe Milo Memorial Prize for academic excellence and scientific accomplishments for my Ph.D. research.
* 2008-2010: **M.Sc.** Weizmann Institute of Science at the bioinformatics track in the **Computer Science** department in the lab of Prof. Amos Tanay. Thesis title: “A computational model for prediction of Polycomb recruitment elements in fruit flies’ embryos”.
* 1991-1995: **B.Sc.** in **Electrical Engineering** in Tel-Aviv University (graduated cum laude).

**Work and research experience**

* 2020: **Principal Investigator, Sagol Department of Neurobiology, University of Haifa.** My lab focuses on modeling bipolar disorder and Parkinson’s disease with human neurons derived using induced pluripotent stem cells and brain organoids. Additionally, we have started to model a few neurodevelopmental disorders that are caused by specific high-penetrance mutations. We are searching for biomarkers for drug response in bipolar disorder and employ machine learning for classification of drug responsiveness. In Parkinson’s disease, we use computational models to predict disease state from differentially expressed genes.
* 2003-2007: **MOTOROLA Communications Israel**

**Team leader** of the speech processing team in the New Technologies Department.

We developed and implemented speech processing algorithms such as VAD (Voice Activity Detector) for very low SNR conditions (less than 0 dB), a few vocoder protocols, DOA (Direction of Arrival) Estimator for a microphone array, and Noise Suppressor for a microphone array. Our work included research, algorithm development, simulation, and implementation for different cellular environments (Digital Signal processors by TI). I filed 3 patents as the lead inventor and received the Motorola CEO Award for research and development in Motorola Israel in 2005.

* 2000-2003: **INTEL – cellular division, Israel**

2003: **Team leader** in the MODEM group in the 3-pt project. We developed the Acquisition (Initial synchronization) for GSM, GPRS, and EGPRS protocols. The work included high-level design, algorithm development, simulation, implementation (on MSA processor), and lab integration with higher layers. The algorithms implemented were embedded in 2nd and 2.5nd cellular phones.

2000 – 2002: **Team leader** in the MODEM group in the WBCDMA project. We developed the Low-Level Receiver for WBCDMA (3GPP protocol – 3rd generation cellular phones). The work included high-level design, algorithm development, simulation, implementation on Palm (Digital Signal Processor by TI), and lab integration with HW and higher layers.

* 1999-1999: **Information Storage Devices (ISD) company**

**DSP team leader**. The work included research, algorithm development, and implementation of Acoustical and Electrical Echo Canceller for hands-free telephones (DECT protocol) on an Analog Devices Digital Signal Processor.

* 1997-1998: **MOTOROLA Communications Israel**

**DSP engineer**. Research, development, and implementation for several speech processing algorithms such as VAD (Voice Activity Detector), CNG (Comfort Noise Generator), Acoustical Echo canceller for TETRA system (cellular environment) on a Digital Signal Processor by Motorola (Onyx). The algorithms implemented were embedded in TETRA: mobile for the European defense forces.

**Military Service**

* 1995-1997: **Ordnance officer (Lieutenant)**

Project manager and responsible for the maintenance and repair of 3 types of the most advanced tanks and armored carriers in the IDF with guided missiles

**Honors and awards**

* 2020-2021 Zuckerman faculty scholar
* 2020 Ilanit travel award
* 2019 Salk Women & Science Special donation
* 2018 Salk Women & Science Special Awards
* Travel award Astellas Pharma 2018
* Travel award Cellular Dynamics 2017
* 2017 Salk Women & Science Conference Travel Childcare Grant
* Menashe Milo Memorial Prize for academic excellence and scientific accomplishments 2016
* Invited speaker Physics colloquium (4 graduating students chosen by the dean of the faculty) 2015
* Best mentor for visiting summer students 2011
* Israel Ministry of Science - Women in Science award 2011
* Auto-Schwartz fellowship 2009
* Motorola CEO award for research and development in Motorola Israel, 2005
* Academic Excellence Award commemorating fallen Israeli soldiers, Electrical Engineering 1991, 1992 (Tel-Aviv University)
* Dean's list of excellent students in Engineering 1991, Tel-Aviv University
* Dean's list of excellent students in Engineering 1990, Tel-Aviv University

**Media Coverage**

* <https://www.salk.edu/news-release/altered-potassium-levels-in-neurons-may-cause-mood-swings-in-bipolar-disorder/>
* <http://inside.salk.edu/summer-2017/next-gen-delving-best-worlds-shani-stern/>
* <http://www.salk.edu/news-release/new-method-predicts-will-respond-lithium-therapy/>

**Publications**

**Original research articles**

* T. Figueiredo, A.P.D. Mendes,G.S. Kobayashi, D.P. Moreira, D. Oliviera, E. Goulart, **S. Stern**, F. Kok, M.C. Marchetto, R. Santos, F.H. Gage, M. Zatz**.** Inositol monophosphatase 1 (IMPA1) mutation in intellectual disability patients impairs neurogenesis but not gliogenesis. In press **Molecular Psychiatry**.
* Liron Mizrahi, **Shani Stern.** Age separation dramatically reduces COVID-19 mortality rate in a computational model of a large population. **MedRxiv, 2020.**
* **Shani Stern**, Anindita Sarkar, Dekel Galor, Tchelet Stern, Ariana Mei, Gabriella Goldberg, Yam Stern, Renata Santos, Anne Bang, Martin Alda, Carol Marchetto, Fred Gage. A physiological instability displayed in hippocampal neurons derived from lithium non-responsive bipolar disorder patients. **Biological Psychiatry 2020.**
* **Shani Stern**, Anindita Sarkar, Tchelet Stern, Arianna Mei, Ana P. D. Mendes, Yam Stern, Gabriela Goldberg, Dekel Galor, Thao Nguyen, Lynne Randolph-Moore, Yongsung Kim, Guy Rouleau, Anne Bang, Martin Alda, Renata Santos, Maria C. Marchetto, Fred H. Gage. Mechanisms underlying the hyperexcitability of CA3 and dentate gyrus hippocampal neurons derived from bipolar disorder patients. **Biological Psychiatry 2020**.
* Imran H. Quraishi\*, **Shani Stern\***, Kile Mangan\*, Yalan Zhang, Syed R. Ali, Michael R. Mercier, Maria C. Marchetto, Michael J. McLachlan, Eugenia M. Jones, Fred H. Gage and Leonard K. Kaczmarek**.** An epilepsy-associated KCNT1 mutation enhances excitability of human iPSC-derived neurons by increasing Slack KNa currents. **The Journal of Neuroscience 2019**.(\* equally contributed)
* Simon T. Schafer, Apua C. M. Paquola, **Shani Stern**, David Gosselin, Manching Ku, Monique Pena, Thomas J. M. Kuret, Marvin Liyanage, Abed AlFatah Mansour, Baptiste N. Jaeger, Maria C. Marchetto, Christopher K. Glass, Jerome Mertens & Fred H. Gage. Pathological priming causes developmental gene network heterochronicity in autistic subject-derived neurons. **Nature Neuroscience 2019.**
* Anindita Sarkar, Arianna Mei, Apua Paquola, **Shani Stern**, Cedric Bardy, Jason Klug, Stacy Kim, Neda Neshat, Hyung Joon Kim, Manching Ku, Maxim N. Shokhirev, David Adamowicz, Maria Carolina Marchetto, Roberto Jappeli, [Jennifer A. Erwin](https://www.sciencedirect.com/science/article/pii/S1934590918301711), [Krishnan Padmanabhan](https://www.sciencedirect.com/science/article/pii/S1934590918301711), [Matthew Shtrahman](https://www.sciencedirect.com/science/article/pii/S1934590918301711), [Xin Jin](https://www.sciencedirect.com/science/article/pii/S1934590918301711),  [Fred H. Gage](https://www.sciencedirect.com/science/article/pii/S1934590918301711),Efficient Generation of CA3 Neurons from Human Pluripotent Stem Cells Enables Modeling of Hippocampal Connectivity *In Vitro*. **Cell Stem Cell 2018;** <https://doi.org/10.1016/j.stem.2018.04.009>.
* **S Stern\***, R Santos\*, MC Marchetto, APD Mendes ,GA Rouleau ,S Biesmans , Q-W Wang, J Yao, P Charnay, AG Bang, M Alda and FH Gage. Neurons derived from patients with bipolar disorder divide into intrinsically different sub-populations of neurons, predicting the patients’ responsiveness to lithium (\* equally contributed) (Appeared on the June 2018 cover). **Molecular Psychiatry** **2018**; doi: [10.1038/mp.2016.260](https://dx.doi.org/10.1038/mp.2016.260).
* **Shani Stern**, Rinat Keren and Elisha Moses. Potassium channel regulators are differentially expressed in hippocampi of Ts65Dn and Tc1 Down syndrome mouse models. **BioRxiv** 2018.
* **Shani Stern,** Assaf Rotem, Yuri Burnishev, Eyal Weinreb and Elisha Moses. **JoVE** 2017. External excitation of neurons using electric and magnetic fields in one- and two- dimensional cultures.
* **Stern S**, Biron D, Moses E. 2016. Transmission of trisomy decreases with maternal age in mouse models of Down syndrome, mirroring a phenomenon in human Down syndrome mothers. **BMC Genetics** 17(1):105.
* **Stern, Shani**, Menahem Segal and Elisha Moses (2015). **EBioMedicine**, Volume 2, Issue 9, 1048 – 1062. Involvement of Potassium and Cation Channels in Hippocampal Abnormalities of Embryonic Ts65Dn and Tc1 Trisomic Mice.
* **Stern S**, Agudelo-Toro A, Rotem A, Moses E, Neef A (2015) Chronaxie Measurements in Patterned Neuronal Cultures from Rat Hippocampus. **PLoS ONE** 10(7): e0132577. doi:10.1371/journal.pone.0132577
* Schuettengruber B, Oded Elkayam N, Sexton T, Entrevan M, **Stern S**, Thomas A, et al. Cooperativity, Specificity, and Evolutionary Stability of Polycomb Targeting in Drosophila. **Cell Reports**. 2014;9(1):219-33. doi: <http://dx.doi.org/10.1016/j.celrep.2014.08.072>.

**Review articles**

* **Shani Stern**, Sara Linker, Krishna C. Vadodaria, Maria C. Marchetto, Fred H. Gage. Prediction of response to drug therapy in psychiatric disorders. **Open Biology**, **the Royal Society** (2018).
* Vadodaria, K. C., **Stern, S.**, Marchetto, M. C. and Gage, F. H. (2017) Serotonin in psychiatry: in vitro disease modeling using patient-derived neurons. **Cell and Tissue Research**.

**Book chapters**

* E. Moses and **S. Stern**, “Design of logical devices with neuronal cultures”, in *Control motor y cognicion*, *propiedades emergentes de redes neuronales* edited by Ranulfo Romo Pablo Rudomin, El Colegio Nacional Mexico City 2012.

**Patents**

* (WO/2008/005702) APPARATUS AND METHOD FOR PROCESSING AN AUDIO SIGNAL. Inventors: Shani Stern, Itzhak Avayu.
* (WO 2007/040883) VOICE ACTIVITY DETECTOR. Inventors: Shani Stern, Itzhak Avayu, Lev Levshits.
* (WO/2007/030190) VOICE ACTIVITY DETECTOR AND METHOD OF OPERATION THEREIN. Inventors: Shani Stern, Izak Avayu, Uzi Cohen.