

BIOGRAPHICAL SKETCH

NAME: Alon, Shahar

eRA COMMONS USER NAME (credential, e.g., agency login): SHAHARALON

POSITION TITLE: Assistant professor / Senior lecturer
 Faculty of Engineering, the Gonda Brain Research Center, the Institute for Nanotechnology, Bar-Ilan University

EDUCATION/TRAINING

| INSTITUTION AND LOCATION | DEGREE (if applicable) | Completion Date MM/YYYY | FIELD OF STUDY |
|---------------------------------------|---------------------------|----------------------------|-------------------------------------|
| Bar-Ilan University, Israel | B.Sc. | 10/00 | Physics |
| Tel-Aviv University, Israel | M.Sc. | 10/08 | Genomics, Neurobiology |
| Tel-Aviv University, Israel | Ph.D. | 10/14 | Genomics, Neuroscience |
| Massachusetts Institute of Technology | Postdoc | 10/19 | Bioengineering, Neuroengineering |

A. Personal Statement

I am a senior lecturer (equivalent to assistant professor) and lead the spatial genomics lab at the faculty of engineering, Bar-Ilan University. I am a relatively new PI, with a lab established almost 4 years ago after completing a post-doctoral training at MIT. I am a physicist and neuroscientist in training, and skilled in several domains of engineering, ranging from data science to genomics to bioengineering to optics and imaging. I am passionate about the importance of RNA in tissues, in health and disease. Over the last 10 years I have created new technologies and analysis methods to measure RNA. In my lab at Bar-Ilan university I study the 3D location of RNA molecules inside cells and tissues. I lead a multidisciplinary team (2 M.Sc. students, 4 Ph.D. students and 2 postdocs) with background in engineering, physics, computer science and biology. My team generates experimental data and deciphers the resulting data using statistical and machine learning tools. I collaborate with several labs around the world to bring new technologies and analysis tools to bear upon the study of complex tissues, in health and disease. Currently my lab mainly studies subcellular localisation of RNA in neurons and neurodegenerative diseases (Alzheimer's and retinal diseases). Recently, we started studying immune-tumour interactions using cancer biopsies from patients. During my academic career, I won several prestigious prizes, including Rothschild, Clore, and the Life Science Research Foundation Fellowship (~2% success rate). Recently I was awarded the ERC starting grant by the European Union. I was invited speaker in several international conferences and was awarded several grants in the last 4 years. My past and present skills and expertise are directly relevant to this project and will provide a solid foundation for its success. I am confident that based on my expertise and the preliminary results obtained in my lab, this exciting project can be achieved.

B. Positions, Scientific Appointments, and Honors**Positions and Scientific Appointments**

2019 (Oct)- Senior Lecturer (eq. to Assistant Professor), Faculty of Engineering, the Gonda Brain Research Center, and the Institute for Nanotechnology, Bar-Ilan University, Israel
 2016-19 Howard Hughes Medical Institute Fellow, McGovern Institute, MIT, Cambridge, MA
 2014-2016 Rothschild Fellow, Media Lab and McGovern Institute for Brain Research, MIT, Cambridge, MA
 2012 Visiting Scientist, Harvard Medical School, Department of Genetics, Boston, MA
 2009-2014 The Interdisciplinary Doctoral Program in Neuroscience for at Tel Aviv University, Israel
 2008 Computational Structural Biologist, Functional Genomics Lab, Bar Ilan University
 2000-2005 Computational Physicist, Nuclear Research Center - Negev, Department of Physics, Israel

Honors (selected)

2023-2028 Starting Grant | ERC - European Union
 2016-2019 Life Science Research Foundation Fellowship (~25 Ph.D. from all the Life Sciences fields receive this scholarship in U.S. each year from more than 1000 applicants)

2014-2016 Rothschild Postdoctoral Fellowship (12 Ph.D. receive this scholarship in Israel each year)
2011-2014 Clore Foundation Fellowship for Outstanding Scholars (10 Ph.D. students from all STEM fields receive this scholarship in Israel each year)

C. Contributions to Science

33 manuscripts, 5 granted US patents, 3 book chapter, 2907 citations, h-index 27.

1. I created technologies and data analysis tools to allow super-resolution in situ sequencing. The 3D location of RNA molecules inside cells and tissues is known to be important, especially in the nervous system, but was impossible to investigate due to lack of appropriate technology. I therefore built a new technology and data analysis pipeline to sequence RNA inside intact cells and tissues, while preserving the exact 3D location of the RNA molecules. The technology I co-led is currently the only bona fide super-resolution method in the emerging field of spatially resolved transcriptomics.

a. **Alon S**, ..., Church GM, Marblestone AH, Boyden ES. Expansion Sequencing: Spatially Precise In Situ Transcriptomics in Intact Biological Systems. **Science** 371: eaax2656. (2021). Covered by: Nature Methods, Nature, NIH Director's Blog and more.

b. Chen F, Wassie AT, Cote AJ, Sinha A, **Alon S**, Asano S, Daugharthy ER, Chang JB, Marblestone A, Church GM, Raj A, Boyden ES. Nanoscale Imaging of RNA with Expansion Microscopy. **Nature Methods**, 13:679-684 (2016).

2. I built computational tools to detect sequence variations in RNA without a reference genome, which enabled the detection of RNA editing events that dramatically change the proteome in cephalopods nervous system. This is considered the best-known example of how RNA editing can create complexity in the nervous system and might explain the sophisticated behavior of squid and octopus.

a. Liscovitch-Brauer N, **Alon S**, Porath HT, Elstein B, Unger R, Ziv T, Admon A, Levanon EY, Rosenthal JJC, Eisenberg E. Trade-off between Transcriptome Plasticity and Genome Evolution in Cephalopods. **Cell**, 169:191–202. (2017) Covered by: Cell Journal Cover, Nature, Nature Reviews Genetics, New York Times, Washington Post, Daily Mail, Scientific American, The Atlantic and more.

b. **Alon S**, Garrett SC, Levanon EY, Olson S, Graveley BR, Rosenthal JJC, Eisenberg E. The majority of transcripts in the squid nervous system are extensively recoded by A-to-I RNA editing. **eLife**, 4, e05198. (2015) Covered by: Science Magazine Editor's Choice, NHGRI, NSF and more.

3. Using statistical methods, I constructed approaches to detect functionally important sequence variations in microRNA in the human brain, as well as approaches for accurate and multiplexed measurement of microRNA in general. The detected microRNA variations in the human brain are considered the gold standard in the field, and were shown to be important in glioblastoma. The multiplexed measurement protocols that we established were adopted by the community, as well as by commercial companies.

a. Tomaselli S, Galeano F, **Alon S**, Raho S, Galardi S, Polito VA, Presutti C, Vincenti S, Eisenberg E, Locatelli F, Gallo A. Modulation of microRNA editing, expression and processing through ADAR2 deaminase in glioblastoma. **Genome Biology**, 16:5 (2015).

b. **Alon S***, Mor E*, Vigneault F*, Gallo A, Locatelli F, Church GM, Shomron N, Eisenberg E. Systematic identification of edited microRNAs in the human brain. **Genome Research**, 22:1533-1540 (2012). *Equal contribution.

c. **Alon S***, Vigneault F*, Eminaga S, Christodoulou D, Seidman J, Church GM, Eisenberg E. Bar-coding bias in high-throughput multiplex sequencing of miRNA. **Genome Research**, 21:1506–1511 (2011). *Equal contribution.

4. I established computational tools that enable accurate identification of genome-wide rhythms in RNA expression. This allowed detection of daily rhythms of expression in the fish brain, as well as in one of the most ancient animal forms - the coral. The findings point to the evolutionary conserved physiological importance of daily rhythms in gene expression.

a. Kaniewska P*, **Alon S***, Karako-Lampert S, Hoegh-Guldberg O, Levy O. Signaling cascades and the importance of moonlight in coral broadcast mass spawning. **eLife**, 10.7554/eLife.09991 (2015). Covered by eLife Insight: 'Sex under the moon'. *Equal contribution.

b. Levy O*, Kaniewska P*, **Alon S**, Eisenberg E, Karako-Lampert S, Bay LK, Reef R, Rodriguez-Lanetty M, Miller DJ, Hoegh-Guldberg O. Complex diel cycles of gene expression in the coral-algal symbiosis. **Science**, 331:175 (2011). *Equal contribution.

Complete List of Published Work in my Google Scholar page:

<https://scholar.google.com/citations?user=BJ02tcMAAAAJ&hl=en>