

Ella Orion Lachman, Ph.D.

Department of Physics

University of California, Berkeley

Berkeley, CA 94720

✉ ellal@berkeley.edu

☎ (510) 993 5482

🌐 <http://ellachman.github.io/>

Education

- 2017 ■ **Ph.D., Weizmann Institute of Science, Israel** in Condensed Matter Physics.
Thesis title: *Study of magnetically doped topological insulators using a scanning SQUID-on-tip microscope*
Advisor: Prof. Eli Zeldov
- 2012 ■ **M.Sc. Physics, Weizmann Institute of Science, Israel**
Thesis title: *Study of Vortex Dynamics in Type-II Superconductors by SOT microscopy.*
Advisor: Prof. Eli Zeldov
- 2009 ■ **B.Sc. Physics and Chemistry (Exact-Sciences program), Hebrew University of Jerusalem, Israel**
magna cum lauda

Experience

Physics research

- since 2017 ■ **Postdoctoral researcher.** Quantum Materials Laboratory, UC Berkeley (USA)
Advisor: James Analytis
- Produced high quality single crystals of $Co_3Sn_2S_2$.
 - Demonstrated the existence of a frustration-drive spin glass coexisting with the ferromagnetic phase.
 - Initiated a collaboration with Dr. Anahory at Hebrew University of Jerusalem to explore the microscopic origins of exchange bias in the material.
- This work resulted in a publication in Nature Communications. Another manuscript is under review.
- 2009 – 2017 ■ **Graduate student** Zeldov group, Weizmann Institute of Science (Israel)
Advisor: Eli Zeldov
- Designed and built a scanning SQUID microscope working at 300 mK.
 - Demonstrated the superparamagnetic nature of the magnetization in magnetically doped topological insulators.
 - Demonstrated the relation between larger superparamagnetic domains and a higher temperature for the quantum anomalous Hall effect.
- This work resulted in 2 publications in Science Advances and in npj Quantum Materials.

Experience (continued)

- 2008 – 2009 ■ **Undergraduate Student Position.** Banin group, Hebrew University of Jerusalem (Israel)
Advisor: Uri Banin
- Used a combination of confocal and atomic force microscopy to study fluorescent single nano particles.
- This work appeared in a publication in Nano Letters.

Teaching and Science communication

- 2020 ■ **Completed the Learner-centered Teaching course** (10-hour class, instructor led and peer reviewed, pedagogical training in learner-centered active teaching approaches). Lesson subject: learning vector arithmetic through the Halbach array.
- May2020 – Dec2020 ■ **COO LittleBig Science:**
<https://lbscience.org/about/>
<https://www.facebook.com/MadaGB>
Includes various projects management and human resources management
Initiated and directed "Virtual Lectures" project.
- since 2016 ■ **Contributing writer and editor** LittleBig Science
- 2016 – 2017 ■ **Contributing writer.** Davidson Institute's website:
<http://davidson.weizmann.ac.il>.
- 2011 – 2012 ■ **Visitors' guide.** Clore Garden of Science, Weizmann Institute of Science.

Awards and distinctions

- 2018-2020 ■ Awardee of the Weizmann Institute of Science - National Postdoctoral Award Program for Advancing Women in Science.
- 2009 ■ Graduated *magna cum lauda*.

Seminars and Talks

- Feb 2020 ■ **Quantum Matter Seminar (Caltech, USA)**, Exchange biased Anomalous Hall Effect driven by frustration in a magnetic Kagome lattice.
- Oct 2019 ■ **3rd EPIQS-TMS alliance workshop on Topological Phenomena in Quantum Materials (KITP, USA)**, Exchange biased Anomalous Hall Effect driven by frustration in a magnetic Kagome lattice.
- Mar 2018 ■ **American Physical Society March meeting (Los Angeles, USA)**, Observation of Superparamagnetism in Coexistence with Quantum Anomalous Hall $C = \pm 1$ and $C = 0$ Chern States.
- Oct 2017 ■ **ABC...z seminar, (UC Santa Barbara, USA)**, Magnetism in magnetically doped topological insulators revealed by SQUID-On-Tip microscopy.
- Mar 2016 ■ **GLAM Special Seminar, (Stanford, USA)**, SQUID-On-Tip microscopy of magnetically doped topological insulators.
- **American Physical Society March meeting (Baltimore, USA)**, Visualization of superparamagnetic dynamics in magnetic topological insulators.

Seminars and Talks (continued)

Dec 2015 ■ **The Israel Physical Society Conference 2015, (BIU, Israel) - Invited talk,**
Visualization of superparamagnetic dynamics in magnetic topological insulators.

Skills

- Experimental - Hardware ■ Cryogenics, Scanning probe microscopy, micropipette handling and SQUID-On-Tip fabrication, evaporation and sputtering, crystal growths, transport measurements, magnetic measurements, strain measurements, VdW materials manipulation.
- Experimental - Software ■ Design and automation of experiments (LabView), image and data analysis (MatLab, Python), Arduino programming and interfacing with chip evaluation boards.
- 3D part design ■ table-top scale (SPM system, strain system), high precision mm sized parts for CNC fabrication, micron-sized sample masks for e-beam and optical lithography.
Using Autodesk Inventor, Layout Editor and Eagle Cad.
- Teaching and Outreach ■ Learner-centered Teaching.
Guiding groups of all ages (K-12 to seniors) and education levels (non-scientific to physics undergraduates) through physics exhibits at the Clore garden of science.
Public speaking in both Hebrew and English about superconductivity, [the wonders of microscopy](#), [superconductivity](#) and topological phases.
Writing about scientific subjects to the general public.

Research Publications

Journal Articles

- 1 Anahory, Y., Naren, H. R., **Lachman, E.**, Buhbut Sinai, S., Uri, A., Embon, L., Yaakobi, E., Myasoedov, Y., Huber, M. E., Klajn, R. & Zeldov, E. (2020). Squid-on-tip with single-electron spin sensitivity for high-field and ultra-low temperature nanomagnetic imaging. *Nanoscale*, 12, 3174–3182. <https://doi.org/10.1039/C9NR08578E>
- 2 **Lachman, E.**, Murphy, R. A., Maksimovic, N., Kealhofer, R., Haley, S., McDonald, R. D., Long, J. R. & Analytis, J. G. (2020). Exchange biased anomalous hall effect driven by frustration in a magnetic kagome lattice. *Nature Communications*, 11(1), 560. <https://doi.org/10.1038/s41467-020-14326-9>
- 3 Uri, A., Kim, Y., Bagani, K., Lewandowski, C. K., Grover, S., Auerbach, N., **Lachman, E.**, Myasoedov, Y., Taniguchi, T., Watanabe, K., Smet, J. & Zeldov, E. (2019). Nanoscale imaging of equilibrium quantum hall edge currents and of the magnetic monopole response in graphene. *Nature Physics*. <https://doi.org/10.1038/s41567-019-0713-3>

- 4 **Lachman, E.**, Mogi, M., Sarkar, J., Uri, A., Bagani, K., Anahory, Y., Myasoedov, Y., Huber, M. E., Tsukazaki, A., Kawasaki, M., Tokura, Y. & Zeldov, E. (2017). Observation of superparamagnetism in coexistence with quantum anomalous Hall $C = \pm 1$ and $C = 0$ Chern states. *npj Quantum Materials*, 2(1), 70. <https://doi.org/10.1038/s41535-017-0072-1>
- 5 Embon, L., Anahory, Y., Jelić, Ž., **Lachman, E.**, Myasoedov, Y., Huber, M. E., Mikitik, G. P., Silhanek, A. V., Milošević, M. V., Gurevich, A. & Zeldov, E. (2017). Imaging of super-fast dynamics and flow instabilities of superconducting vortices. *Nature Communications*, 8(1), arXiv 1706.00628, 85. <https://doi.org/10.1038/s41467-017-00089-3>
- 6 Uri, A., Meltzer, A. Y., Anahory, Y., Embon, L., **Lachman, E.**, Halbertal, D., HR, N., Myasoedov, Y., Huber, M. E., Young, A. F. & Zeldov, E. (2016). Electrically Tunable Multiterminal SQUID-on-Tip. *Nano Letters*, 16(11), arXiv 1606.05088, 6910–6915. <https://doi.org/10.1021/acs.nanolett.6b02841>
- 7 **Lachman, E.**, Young, A. F., Richardella, A., Cuppens, J., Naren, H. R., Anahory, Y., Meltzer, A. Y., Kandala, A., Kempinger, S., Myasoedov, Y., Huber, M. E., Samarth, N. & Zeldov, E. (2015). Visualization of superparamagnetic dynamics in magnetic topological insulators. *Science Advances*, 1(10), e1500740–e1500740. <https://doi.org/10.1126/sciadv.1500740>
- 8 Finkler, A., Vasyukov, D., Segev, Y., Ne’eman, L., **Lachman, E.**, Rappaport, M. L., Myasoedov, Y., Zeldov, E. & Huber, M. E. (2012). Scanning superconducting quantum interference device on a tip for magnetic imaging of nanoscale phenomena. *The Review of scientific instruments*, 83(7), 073702. <https://doi.org/10.1063/1.4731656>
- 9 Yoskovitz, E., Menagen, G., Sitt, A., **Lachman, E.** & Banin, U. (2010). Nanoscale Near-Field Imaging of Excitons in Single Heterostructured Nanorods. *Nano Letters*, 10(8), 3068–3072. <https://doi.org/10.1021/nl101614s>

Extra Curricular

- Fellow physicist and editor at “Mada Gadol Baktana”, the largest independent science outreach group in Israel. <http://lbscience.org/>
- Co-organizer, Weizmann Condensed Matter student journal club (2014)
- Zeldov Group website and blog coordinator (2014-2017)
- A member of the Israeli Physics Society (2012-2015)
- A member of the American Physics Society (since 2015)
- Member of the Weizmann Institute’s theater ensemble (2015-2017)