CURRICULUM VITAE

Levi Amit

CONTACT INFORMATION:

Braude College of Engineering Karmiel
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Physics Department

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MAJOR RESEARCH INTERESTS

Model the transport of volatiles in planetary mantles and interior-surface-atmosphere mass exchange.

- **Ab initio study of Earth and planetary materials using atomistic simulations.** Physical chemistry and material science of planets, physics of Ice, gas hydrates and modeling liquid and solid aqueous solutions using electronic structure modeling and force field methods.
- **Mantle dynamics and tectonics.** Convective flow, boundary layers, plate tectonics, thermal evolution of planets, and how this affects atmospheric outgassing.

EDUCATION

- Tel-Aviv University (TAU), Tel-Aviv, Israel
  Ph.D., Geophysical, Atmospheric and Planetary Sciences, awarded 2015
  Dissertation: “Clathrate Hydrate Thermodynamics and its Application to Solar System Research”
  Advisors: Dimitar Sasselov (Harvard University) & Morris Podolak (TAU)

- Tel-Aviv University, Tel-Aviv, Israel
  M.Sc., *SUMMA CUM LAUDE*, Geophysics & Planetary Sciences, awarded 2008
  Thesis Title: “Gas and Aerosol Atmospheres Around KBOs”
  Advisor: Morris Podolak (TAU)

- Tel-Aviv University, Tel-Aviv, Israel
  B.Sc., *MAGNA CUM LAUDE*, Geophysics and Atmospheric and Space Sciences, awarded 2006

ACADEMIC AND PROFESSIONAL EXPERIENCE

- Senior Lecturer — 2022 - present
  Braude College of Engineering

- Research Associate — 2018 – 2022
  Origins of Life Initiative
  Astronomy Department
  Harvard University, Cambridge, USA

- Postdoctoral Fellow — 2015 – 2018
  Origins of Life Initiative
  Astronomy Department
  Harvard University, Cambridge, USA

- Harvard Fellow — 2014 – 2015
  Astronomy Department
  Harvard University, Cambridge, USA

MENTORING

Harvard University Undergraduates:

- Ananya Bansal 2021 – 2022 (Completed)
  Project: Ab initio molecular study of the H_2O-CO_2-CH_4 system

Outreach University Undergraduates:

- Refath Bari (CUNY) 2021 – 2023 (Completed)
  Project: Ab initio molecular study of the H_2O-N_2 system

PROFESSIONAL SERVICE

- Member, grant review panel, NASA, 2019
- Reviewer for Icarus, and the Astrophysical journal

ACTIVE PARTICIPATION IN SCIENTIFIC MEETINGS

POSTER PRESENTATIONS

1. **2006** - Israel Physical Society Conference No.52.
2. **2013** - "Methane Cycle in Cold Water Super-Earths", Interior of the Earth, Gordon Research Seminar.
3. **2013** - Interior of the Earth, Gordon Research Conference, poster title-"Methane Cycle in Cold Water Super-Earths".
4. **2014** - "Structure and Dynamics of Cold Water Super-Earths: The Case of Occluded CH4 and its Outgassing". 224th meeting of the AAS, Boston, USA.
5. **2015** - SCOL annual symposium - poster title "Volatile transport in water planets"
6. **2015** - Harvard Origins of Life Initiative – poster session – "Volatile transport in water planets"
7. **2016** - Harvard Origins of Life Initiative – poster session – "The Abundance of CO2 in the Atmospheres of Ocean Exoplanets".
8. **2016** - Emerging Researchers in Exoplanet Science II – Cornell University, USA - "The abundance of atmospheric CO2 in ocean exoplanets".
9. **2017** - SCOL annual symposium – poster title "The pH of Ocean Exoplanets"
10. **2017** - Gordon Research Conferences - Origins of Solar Systems - The abundance of atmospheric CO2 in ocean exoplanets: A novel CO2 deposition mechanism.
11. **2018** - Harvard Origins of Life Initiative – poster session – "The pH of Ocean Worlds and Their Habitable Zone"
12. **2018** – Emerging Researchers in Exoplanet Science IV – Penn State University- "Habitability of Ocean Worlds"
13. **2019** - Harvard Origins of Life Initiative – poster session – "The Equation of State of MH-III: A Possible Deep CH_4 Reservoir in Titan, Super-Titan Exoplanets and Moons"

LECTURES

1. **2011** - "Corona-like Atmospheric Escape from KBOs" at the Grad/Predoc seminar of the CFA, Cambridge, USA.
2. **2013** - "Methane Transport in Water Super-Earths", Meet and Greet SSP-4, short presentation of the latest research, Cambridge, USA.
3. **2013** - "Modeling Super Earths" at the 2nd annual gathering of New England planetary scientists, Boston University, center for space physics.
4. **2013 - Invited Talk**: "A Possible Mechanism for Methane Outgassing in Water Planets", Origins Chalk Talk, Harvard University, Cambridge, USA.
5. **2016** - "Water Worlds" – talk for the department of Earth and planetary sciences at the Weizmann institute of science, Israel.

6. **2016** - "Secondary Atmospheric Outgassing of CH4 and CO2 in Water-Rich Super-Earths"- Geosciences dept. colloquium seminar, Tel-Aviv university, Israel.
7. **2017** - "The abundance of atmospheric CO2 in ocean exoplanets: A Novel CO2 Deposition Mechanism"- Exoplanet pizza lunch, CFA, Cambridge, USA.
8. **2017** - "The pH of Ocean Worlds" – Stars and Planets Science Extravaganza – CFA, Cambridge, USA.
9. **2018** – **Invited Talk**: "Are ocean worlds habitable?" – Exoplanet Tea talk at MIT, Cambridge, USA
10. **2018** – "The pH of Ocean Worlds and Their Unique Habitable Zone" – Exoplanet pizza lunch, CFA, Cambridge, USA.
11. **2018** – "The pH and Salinity of Ocean Worlds: when high-pressure ice separates the ocean from the rocky interior" – AGU, fall meeting, Washington, D.C.
12. **2019** – **Invited Talk**: "The pH of Ocean Worlds: When High-Pressure Ice Governs the Geochemical Evolution" – AbSciCon, Seattle, Washington
13. **2020** – "From Exoplanets to Earth, dynamics and chemistry" – Seminar to the department of geography and environment at Bar-Ilan University
14. **2021** – "Habitability Prospects In Ocean Worlds" – Seminar to the Leon Charney School of Marine Sciences, May 11th
15. **2021** – "Partitioning of Atmospheric O_2 Into High-Pressure Ice in Ocean Worlds" – CFA, November 4th.

ACADEMIC AND PROFESSIONAL AWARDS

- Nominated to the 51 Pegasi b fellowship 2017
- Predoc Fellow 2012 – 2014
  Smithsonian Astrophysical Observatory
- Tel-Aviv university, Department of Geophysics & Planetary Sciences
  Grant for excellence 2007
- Tel-Aviv university, faculty of exact sciences
  Dean's List of Excellence 2005

GRANTS AND FUNDING

- 2019 - European Research Council-funded (ERC) research project at University of Munich (LMU), "Theory of Mantle Core and Technological Materials" – awarded 15 million core hours at the Gauss Centre for Supercomputing, role: Co-I (postdoctoral contributor)

- 2023-2025 - SSAA Funding Opportunity: DE-FOA-0002457 825,000$ “Properties of materials under extreme conditions and/or hydrodynamics, PI: Stein B. Jacobsen (I was a postdoctoral contributor)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

1. American Astronomical Society 2013 – present
2. Deep Carbon Observatory 2015 – present
3. American Geophysical Union 2018 – present

SCIENTIFIC PUBLICATIONS

Articles Published in Peer-Reviewed Journals

1. **A. Levi** & M. Podolak, "Corona-like atmospheric escape from KBOs I. Gas dynamics". Icarus 202 (2009) 681-693.
2. **A. Levi** & M. Podolak, "Corona-like atmospheric escape from KBOs II. The behavior of aerosols". Icarus 203 (2009) 610-625.
3. **A. Levi** and M. Podolak, "Estimating the Density of Intermediate Size KBOs from Considerations of Volatile Retention". Icarus 214 (2011) 308-315.
4. **A. Levi**, D. Sasselov & M. Podolak," Volatile Transport Inside Super-Earths by Entrapment in the Water-Ice Matrix". The Astrophysical Journal, 769:29 (9 pp), 2013
5. **A. Levi**, D. Sasselov & M. Podolak, "Structure and Dynamics of Cold Water Super-Earths: The Case of Occluded CH4 and its Outgassing". The Astrophysical Journal, 792:125 (44pp), 2014
6. **A. Levi**, D. Sasselov & M. Podolak, "The Abundance of Atmospheric CO2 in Ocean Exoplanets: A Novel CO2 Deposition Mechanism". The Astrophysical Journal, 838:24 (45pp), 2017
7. **A. Levi**, S.J. Kenyon, M. Podolak & D. Prialnik, "H-Atmospheres of Icy Super-Earths Formed in situ in the Outer Solar System: An Application to a Possible Planet Nine". The Astrophysical Journal, 839:111 (11pp), 2017
8. **A. Levi** & D. Sasselov, “A New Desalination Pump Helps Define the pH of Ocean Worlds”, The Astrophysical Journal, 857:65 (23pp), 2018
9. R. M. Ramirez & **A. Levi**, “The Ice Cap Zone: a unique habitable zone for ocean worlds” – Monthly Notices of the Royal Astronomical Society, Volume 477, Issue 4, Pages 4627-4640, 2018

10. Li Zeng, Stein B. Jacobsen, Dimitar D. Sasselov, Michail I. Petaev, Andrew Vanderburg, Mercedes Lopez-Morales, Juan Perez-Mercader, Thomas R. Mattsson, Gongjie Li, Matthew Z. Heising, Aldo S. Bonomo, Mario Damasso, Travis A. Berger, Hao Cao, **Amit Levi**, and Robin D. Wordsworth, "Growth model interpretation of planet size distribution"- Proceedings of the National Academy of Sciences, 116 (20), 9723-9728, 2019
11. **A. Levi** & R. E. Cohen, "The Equation of State of MH-III: a possible deep CH_4 reservoir in Titan, Super-Titan exoplanets and moons", The Astrophysical Journal, 882:71, 2019
12. Li Zeng, Stein B. Jacobsen, Eugenia Hyung, **Amit Levi**, Chantanelle Nava, James Kirk, Caroline Piaulet, Gaia Lacedelli, Dimitar D. Sasselov, Michail I. Petaev, Sarah T. Stewart, Munazza K. Alam, Mercedes Lopez-Morales, Mario Damasso, and David W. Latham - "New Perspectives on Exoplanet Radius Gap from a Mathematica Tool and Visualized Water EOS" – The Astrophysical Journal, volume 923, 247 (2021)
13. **A. Levi** & D. Sasselov, "Partitioning of Atmospheric O_2 Into High-Pressure Ice in Ocean Worlds" - The astrophysical journal, volume 926, 72 (2022)
14. **A. Levi,** A. Bansal* & D. Sasselov, "A High-Pressure Filled Ice in The H_2O-CO_2-CH_4 System: With Possible Consequences for The CO_2-CH_4 Biosignature Pair" – The astrophysical journal, 944 (2), 209 (2023) (* - written with my student as part of her senior thesis project).
15. M. Podolak, A. Levi, A. Vazan & U. Malamud, " An equation of state of CO for use in planetary modeling" - Icarus, 394 115424 (2023)

Articles Submitted

1. R. Bari, A.Levi, S. Ranjan, D. Sasselov, "The Solubility of N2 in High Pressure Ice And Its Consequent Outgassing Limitations in Water Worlds" - submitted to the astrophysical journal.
2. A. Levi, "H2S AND SO2 Solubility in High Pressure Ice, Helping to differentiate Between Water Worlds And Rock Exoplanets" - submitted to the JGR:Planets

ADDITIONAL SKILLS

High-Performance Computing, MATLAB, Python, Fortran & Bash

- Working with CP2K and Quantum ESPRESSO – DFT & and finite temperature ab initio molecular simulations
- GROMACS – molecular simulations with empirical potentials for modeling brine and organic matter hydrophobicity

TEACHING

- Classical mechanics for biotechnology - course 11023
- Classical mechanics for civil engineering - course 421208
- Classical mechanics, electricity and magnetism via numerical computation - course 11158
- Classical mechanics for industrial engineering - course 11209
- Guest lecturer – course name "Life as a Planetary Phenomenon" (SCIPHUNV 30), given at Harvard university by Prof. Dimitar Sasselov. Lectured on the internal structure of Earth, radiometric dating, and geological activity in the solar system.
- Mentoring Program – teaching thermodynamics and basics of molecular simulations to undergraduate students as part of their senior/junior thesis projects.
- I have completed a short (2 weeks) teacher's training course in 2002 for the high-school level. I have served as a teacher's assistant in a boarding school, where I have taught mathematics.

NEWS COVERAGE

- **Forbes/ Science** – "Extrasolar Ocean Worlds In The 'Ice Cap Zone' Could Harbor Life, Say Planetary Scientists"- Mar 31, 2018
- **Scientific American –** "Are Water Worlds Habitable?" – Apr.5th 2018

SCIENTIFIC OUTREACH

- Zerret the Carrot Bedtime Adventure - A science oriented book for little kids - self published on Amazon KDP - 2025