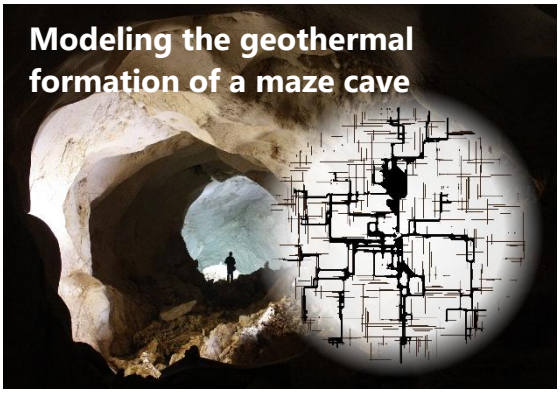
Tel-Hai
University of Kiryat Shmona On the rise

THE HEBREW UNIVERSITY OF JERUSALEM

Three Funded M.Sc./Ph.D. or Postdoctoral Positions (Israel):

Modeling Crustal Geothermal Flow and Water–Rock Interactions – Geological (White) Hydrogen and Hypogene Cave Systems



We seek motivated and curious M.Sc., Ph.D., or Postdoctoral candidates to join funded research projects focused on modeling crustal geothermal flow and water–rock interactions, with applications to geological ("white") hydrogen systems and hypogene cave formation.

Background:

Understanding the processes associated with geothermal flows rising from deep within the Earth's crust, and their accompanying water-rock interactions, is essential for the transition to a low-carbon economy ('the energy transition'). Such flows are sources of geothermal energy and critical minerals required for green technologies, and they are directly linked to carbon capture and storage, hydrogen fuel storage, and other processes within the renewable-energy system.

To address these questions, our research combines mathematical and computational modeling with insights from field observations and laboratory experiments. This interdisciplinary approach—connecting physics, geology, and computational modeling—is a proven methodology for advancing our understanding of subsurface processes.

The current projects focus on three interconnected research directions, described in more detail below: **(1)** hypogene cave systems formed by deep geothermal flow; **(2)** geological ("white") hydrogen generation, migration, and trapping; and **(3)** theoretical and numerical modeling of water–rock interactions and geomechanics in geothermal systems.

The research will involve:

- Mathematical modeling of coupled hydrogeological processes related to geologic hydrogen, hypogene cave formation and geothermal systems.
- Analysis and summarization of results in scientific reports and publications.
- Optional: Integration of fieldwork.

Requirements:

- B.Sc. or M.Sc. degree in Geophysics, Geology, Earth Sciences, Engineering, or Physics (or a related field).
- Strong quantitative background and experience in numerical modeling (MATLAB/Python/COMSOL) – **a major advantage**.
- Ability to work independently, scientific curiosity, and initiative – **strong assets**.
- Knowledge in one or more of the following areas—flow, transport, geomechanics, and reactive processes in porous and fractured rocks – **an advantage**.
- Interest and suitability for fieldwork – **an advantage**.
- Excellent written and verbal communication skills in English.
- Ability to work effectively in an interdisciplinary team.

The research will be conducted under the supervision of **Dr. Roi Roded** (*Tel-Hai, University on the Rise*) and **Prof. Einat Aharonov** and **Prof. Amos Frumkin** (*The Hebrew University of Jerusalem*), in collaboration with additional researchers from Israel and abroad.

- Flexible start date (Spring 2026).
- Positions are fully funded according to institutional regulations and include a competitive living stipend. Health insurance is provided through the Israeli public system.
- International applicants are welcome, and assistance with visa and relocation procedures will be provided.

To apply, please send a **CV** and a short **letter** describing your relevant background and scientific interests to: roi.roded@mail.huji.ac.il. ***We welcome applications from candidates of all genders and backgrounds.***

Our current group focuses on three interconnected themes:

1. **Hypogene cave systems**
   Hypogene caves, formed as a result of deep geothermal flows and characterized by diverse and unique morphologies, serve as natural laboratories for studying these hidden processes. The integration of advanced numerical simulations, three-dimensional mapping methods, and precise geochemical measurements provides an effective framework for deciphering the formation mechanisms of these systems.
2. **Geological ("white") hydrogen**
   Recent discoveries of hydrogen (H_2) seeps and underground reservoirs, along with new scientific insights, suggest that large amounts of natural hydrogen may exist freely in the Earth's upper crust. This naturally produced hydrogen—often called geologic or "white" hydrogen—is a fascinating, poorly understood geological phenomenon that holds promise as a clean, inexpensive, and potentially accessible energy source.
   Studying geological hydrogen is therefore not only an exciting and fundamental scientific question in Earth sciences, but may also contribute to global efforts to reduce carbon emissions. Interest in this topic is rapidly growing, and dozens of companies around the world are now exploring for natural hydrogen. Yet much remains unknown: the processes that produce hydrogen, how it migrates through rocks, and the conditions under which it can remain trapped—yet unreacted—in underground reservoirs over long timescales.
3. **Theoretical modeling of geothermal systems and water–rock interactions**
   Development and application of theoretical and numerical models to describe geothermal flow, heat transport, and water–rock reactions, as well as geomechanical feedbacks in crustal environments, with implications for energy and mineral extraction.