

# ICDP Scientific Drilling Workshop: Deep Geothermal Test Borehole, Cornell Campus



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Cornell University Deep Geothermal Test Borehole:  
An ICDP-sponsored Scientific Planning Workshop

8-10 January 2020

Cornell University campus in Ithaca, New York, USA

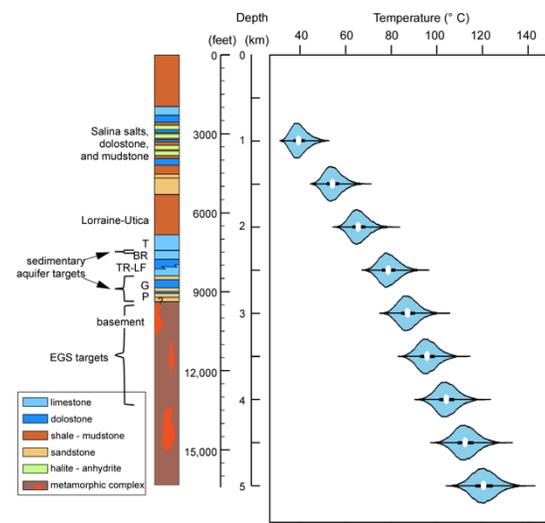
# ICDP Scientific Drilling Workshop: Deep Geothermal Test Borehole, Cornell Campus: 8-10 January, 2020

We invite you to our 3-day scientific borehole planning workshop. The workshop will be held on the Cornell campus in rural New York State, 8-10 January 2020. The workshop aims to bring together scientists and engineers – students, early career, and senior – who have technical interest in the underlying mechanical response of heterogeneous, low porosity rocks to stress perturbations caused by fluid injection or by natural phenomena, and/or an interest in the materials in the crust of eastern North America.

We seek particularly participants from the fields of rock mechanics, hydrogeology, seismology, microbiology, borehole engineering, and regional geology of northeastern North America, as well as representatives from the drilling and geothermal industries.

## Setting and motivation

Cornell University is advancing a plan to drill a test geothermal borehole to 4 – 5 km depth, traversing 3 km of lower Paleozoic sedimentary rock and about 1 km of mid- to high-grade Grenville metamorphic basement, at temperatures expected to be less than 120°C. The university seeks to extract geothermal energy for “direct use” to heat campus buildings, thereby to replace fossil fuels. A pilot borehole is planned to test reservoir conditions and to minimize risks, both of which require an understanding of the mechanical conditions of the solid rocks and fluids. The rock mechanics problem at the core of Cornell’s aspiration not only has numerous societal implications through energy technologies, but also is fundamental to natural earth deformation. This “borehole of opportunity” will be suitably located for examination of the variability in mechanical response of heterogeneous, low porosity rocks to stress perturbations caused by fluid circulation, to enable investigation at the spatial scale of the natural variability of lithology, fabric, and inherited fractures.



## With this workshop we aim to develop a borehole science plan

The Workshop is dedicated to developing a set of borehole experiments and tests that extends beyond the minimum needs of a Cornell site assessment, to be the basis for improving and testing general models of subsurface mechanical regimes. We seek to design experiments that

- 1) Improve understanding of fracture-dominated fluid flow and the thermo-poroelastic response within rocks at 2.5-4.5 km depth of varying bulk properties and varying categories of fractures.
- 2) Document the mechanical state and poroelastic properties of variable lithologic categories of mid- to high-grade metamorphic rock and low porosity sedimentary rock under the conditions of pressure manipulation needed to produce geothermal heat
- 3) Better understand the properties and conditions that influence technical uncertainties associated with intentionally circulating fluids through fractured basement rocks

The outcome will be the drafting of one or more proposals to submit to suitable agencies and organizations. The workshop may identify other meritorious experiments worthy of separate proposals that focus on features of the subsurface system, to coordinate with the borehole opportunity.

## Tentative Agenda

Day 1 morning: Overview of scientific understanding of

- ⇒ stress, strain, and perturbations in deep, low porosity, sedimentary and crystalline basement rocks
- ⇒ strata, basement, and structures of the Ithaca, NY region

Day 1 afternoon: Breakout groups identify valuable opportunities provided by an Ithaca, New York borehole

Day 2 morning: Discuss and compare possible experiments and the practicality of particular tests and sample strategies

Day 2 afternoon: Breakout groups design experimental approaches

Day 3: a small sub-group drafts initial texts of proposals (most participants return home)



## Organizing committee

Teresa Jordan, Regional geology and sedimentary basins; Cornell University, USA

Patrick Fulton, Thermal and hydraulic geophysics; Cornell University, USA

Jefferson Tester, Geothermal systems engineer; Cornell University, USA

Ernst Huenges, geothermal energy and geophysics; GFZ German Research Centre for Geosciences, Germany

David Bruhn, Geothermal engineering and rock mechanics; Technical University Delft, Netherlands/GFZ, Germany

Hiroshi Asanuma, Geothermal engineering; National Institute of Advanced Industrial Sciences and Technology, Japan

## Application to participate

Although registration is free, registration is required for planning purposes. Travel and lodging expenses for about 20 participants will be covered by an award from the International Continental Scientific Drilling Program. Additional interested and qualified parties are welcome to participate, with either partial support or at their own expense.

Please submit a brief application with 1-page resume and a summary of relevant expertise to Dr. Teresa Jordan ([tej1@cornell.edu](mailto:tej1@cornell.edu)) and Dr. Patrick Fulton ([pfulton@cornell.edu](mailto:pfulton@cornell.edu)). A scientific committee will decide on invitations and travel support (fully or partially). Preference will be given to scientists from ICDP member countries (or countries with an interest in joining ICDP) and to scientists or engineers whose expertise complements that of existing project participants. Early career scientists are encouraged to apply.