

Planets: Earth, Mars, & Beyond Research

Aqueous Geochemistry and Astrobiology

- **Dr. Elisabeth (Libby) Hausrath**
- Professor
- Department of Geoscience
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Expertise

- Using laboratory experiments, field work, and modeling to interpret water-rock interactions and soil-forming processes on Earth and Mars
- Interpreting the signatures of past aqueous and biological impacts on minerals
- Participating Scientist on the Mars Science Laboratory Curiosity and the Mars2020 rover Perseverance and member of the Network for Life Detection ([NFOLD](#)) Steering Committee..

Holes made by sampling soil on Mars



Image credit: NASA/JPL-Caltech

<https://mars.nasa.gov/news/9311/nasas-perseverance-rover-gets-the-dirt-on-mars/#:~:text=The%20mission's%20first%20two%20samples,prepare%20for%20future%20missions%20there.>

Rebecca Martin



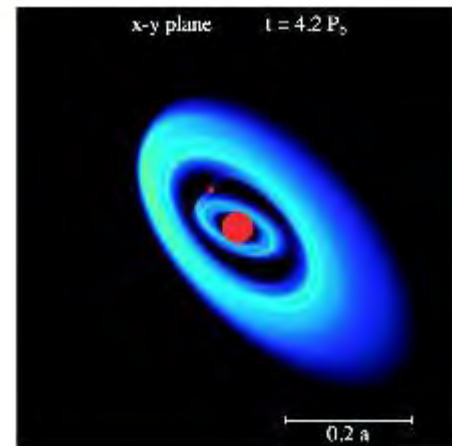
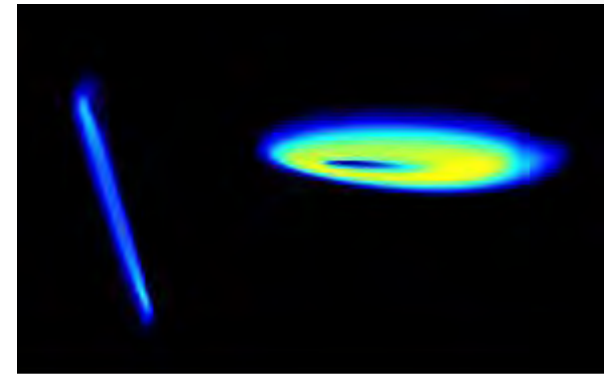
- Assistant Professor of Astronomy, Department of Physics and Astronomy
- Ph.D., BPB 233, Rebecca.Martin@unlv.edu
- http://www.physics.unlv.edu/~rgmartin/Rebecca_G._Martin.html

Areas of Expertise

- Star and planet formation
- Astrophysical Fluids
- Binary Star Systems
- Planetary System Dynamics

Research Summary:

- My research deals with highly topical questions in astrophysics, such as how star and planetary systems form. I use analytic and numerical methods to study the theory of accretion disc dynamics, few body dynamics and planet-disc interactions.



Geomicrobiology

Dr. Aude Picard

Assistant Research Professor

School of Life Sciences

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Expertise

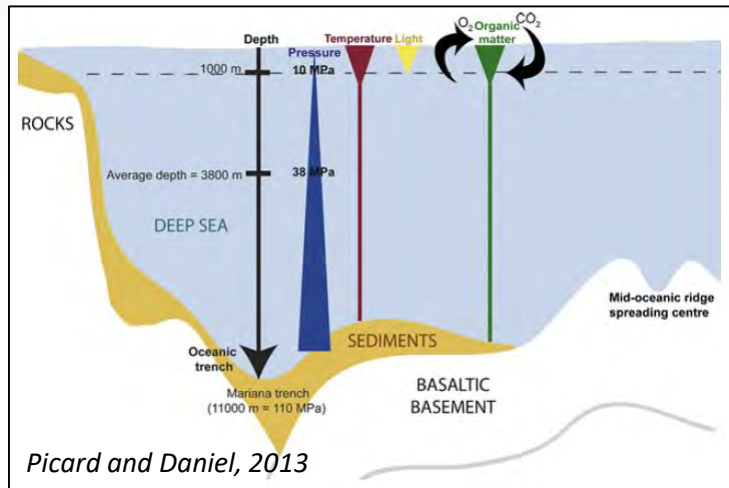
- Anaerobic microbiology
- Microbial physiology
- Biomineralization
- Astrobiology and biosignatures
- Microscopy & spectroscopy

Microbial life in extreme conditions

① Microbial life under high pressure

- What are the pressure limits for microbial life?

High-pressure environments represent the largest habitat for microbial life on Earth



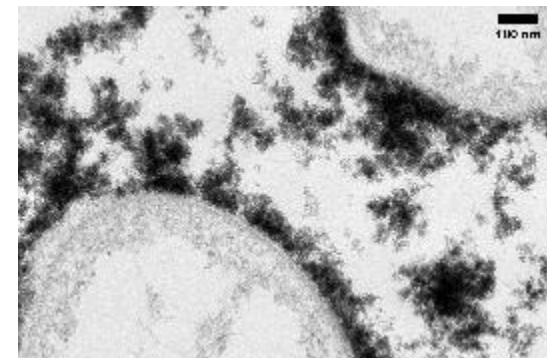
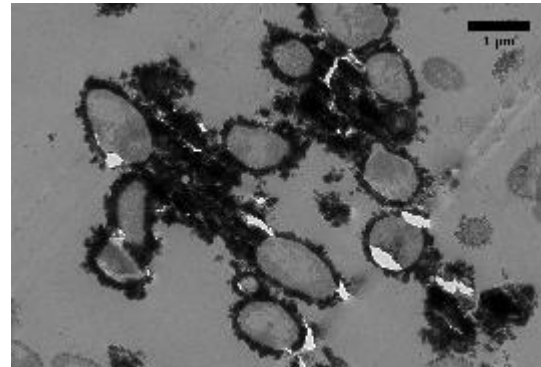
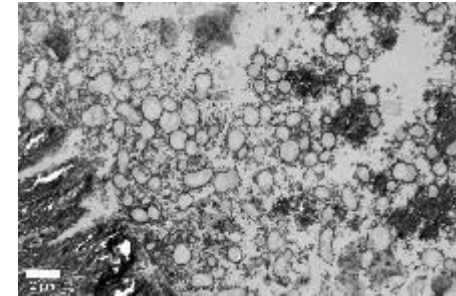
Oceans on icy moons (e.g. Europa) are potential habitats for microbial life in the outer Solar System



② Microbe-mineral interactions

- How do bacteria cope with mineral encrustation?
- Do minerals play a role in long-term survival of bacteria?

Transmission electron microscopy images of bacteria encrusted in iron sulfide minerals

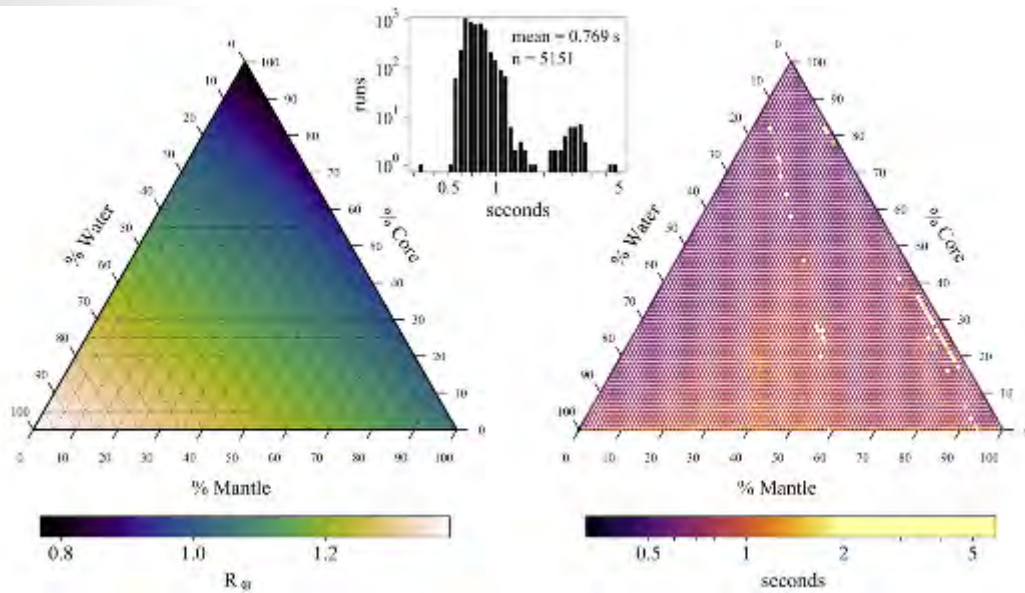


Research Group of Dr. Steffen

- **Dr. Jason H. Steffen**
- Associate Professor
- Department of Physics and Astronomy
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- Website: jasonhsteffen.com

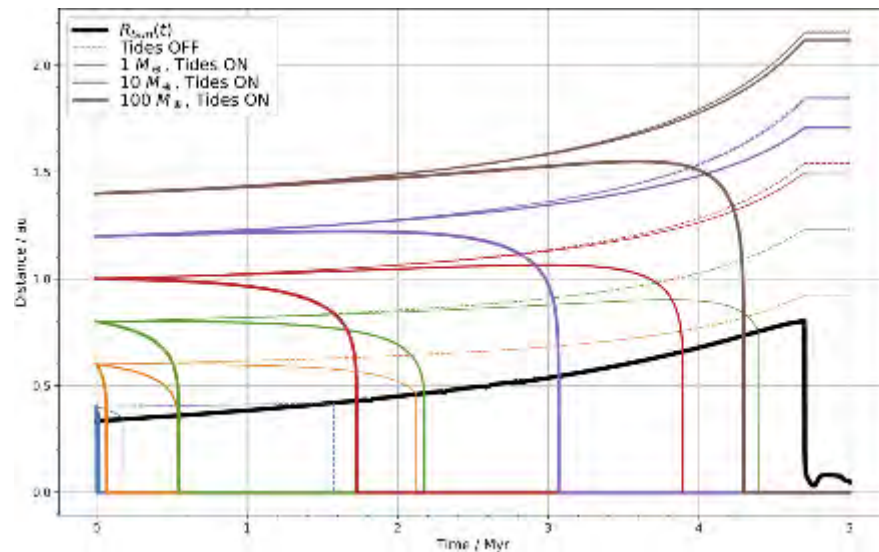
Expertise

- Understanding the properties of extrasolar planets and planetary systems
- Planetary dynamics
- Planet interior modeling
- Composition of planet-forming materials



Timing results for planet models using the MAGRATHEA code, developed by our group at UNLV.

Future of planets in a system during the late stages of stellar evolution, including the effects of tides and stellar mass loss.



Planetary petrology

Dr. Arya Udry

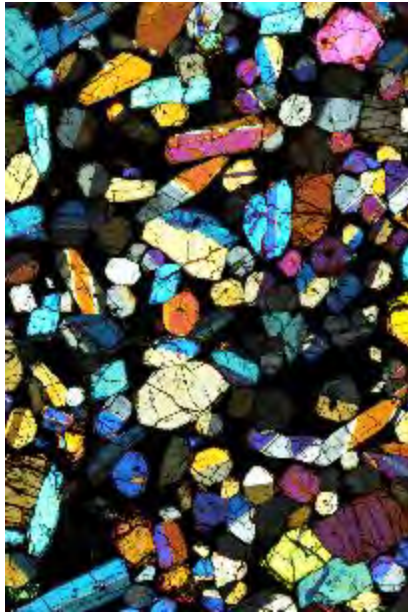
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- Website: aryaudry.com

Expertise:

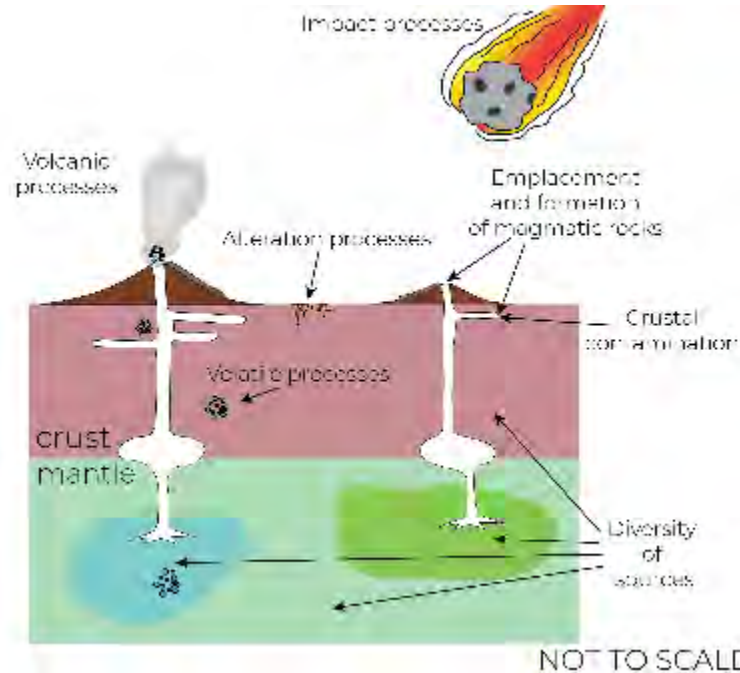
Planetary petrology

Martian igneous geology

Martian geologic evolution using meteorites



Polarized thin section image of nakhlite meteorite MIL 090030



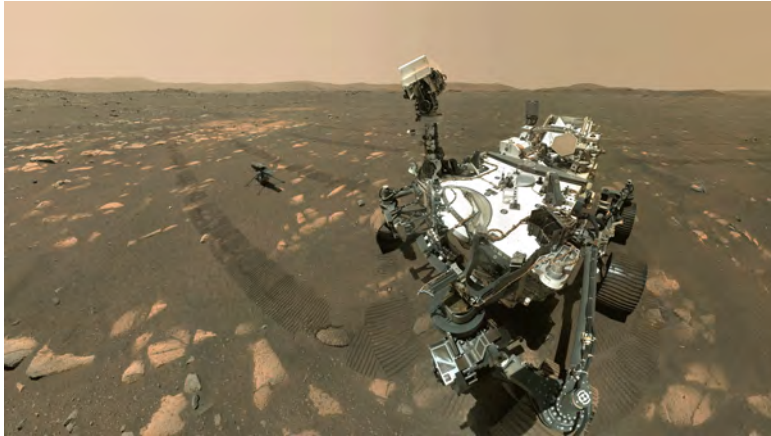
Processes that can be understood using meteorites (Udry et al. 2020)



193 nm Excimer laser ablation system – Installed in 2021 to analyze mineral trace elements

- I use meteorites, the only samples that we possess from Mars, to better constrain the interior composition and evolution of this planet
- Bulk rock and mineral geochemical down to the ppm scale

Martian geologic evolution using rover analyses



Mars 2020 Perseverance and Ingenuity on Jezero crater – JPL/NASA image



Models of magma on Mars (Ostwald et al., 2022)

- ❑ Thermodynamical modeling to understand formation of unique compositions of martian surface
- ❑ I am a participating scientist on the Mars2020 mission and I conduct modeling analyses to help understand the formation of magmatic rocks at Jezero crater

Astrophysical Fluid Dynamics

Dr. Zhaohuan Zhu

Department of Physics and Astronomy

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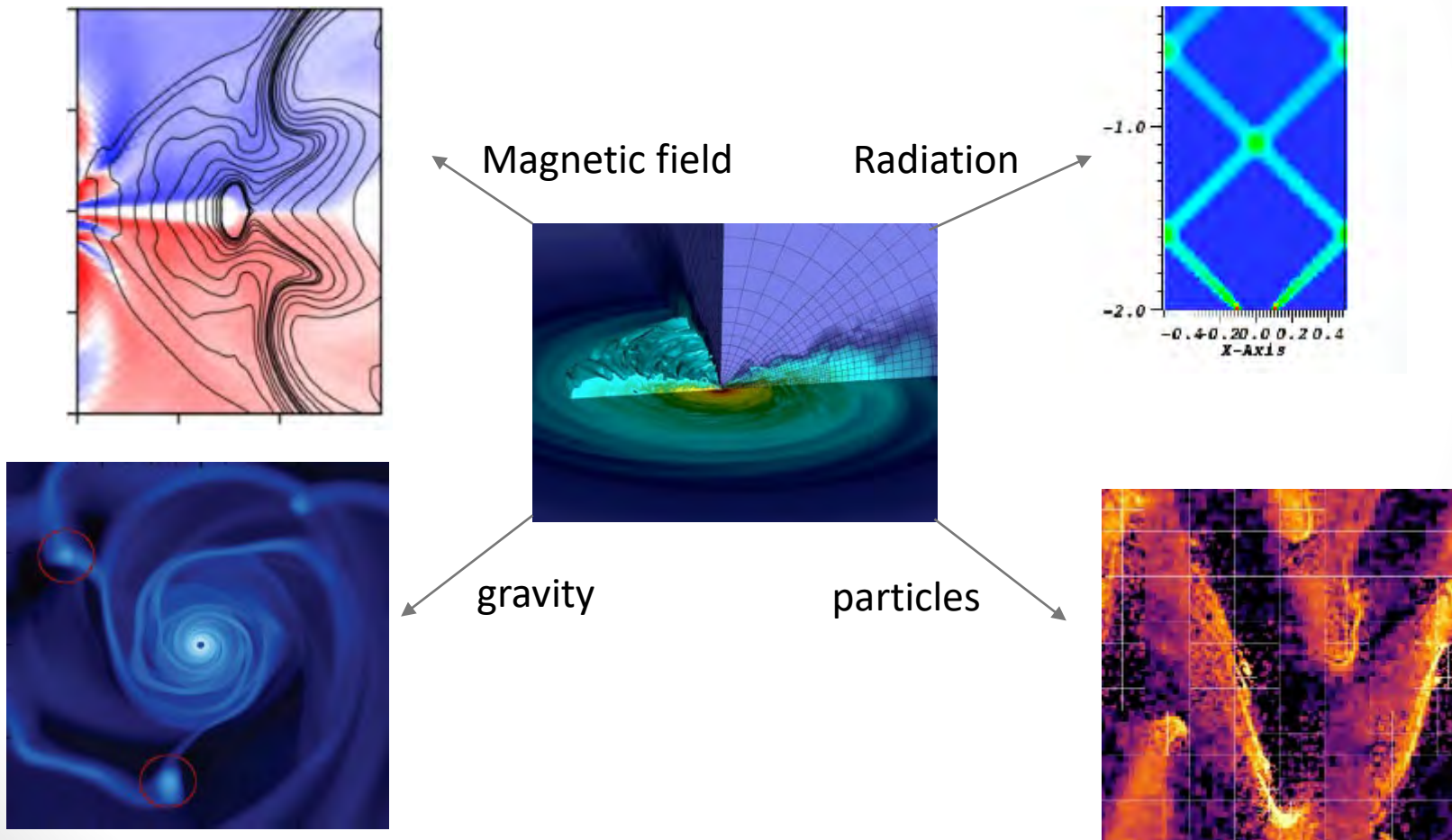
Expertise:

Fluid dynamics for astronomical project

Star and planet formation

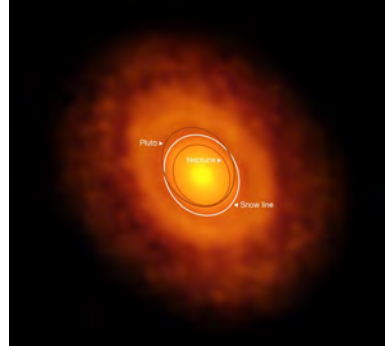
Fluid dynamics:

- Developing and using the state of the art numerical code to solve astrophysical fluid problem.



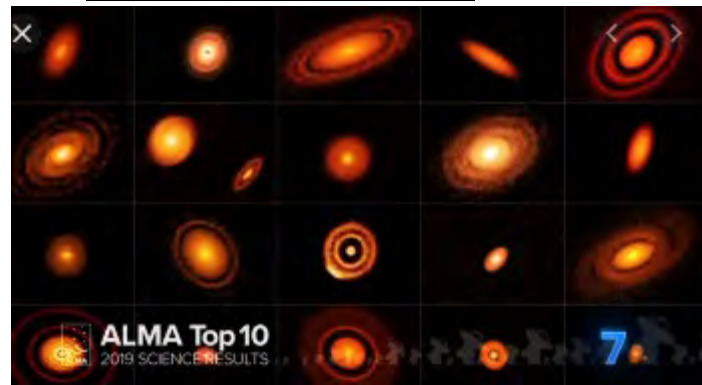
Star and planet formation:

- Protoplanetary disk dynamics:

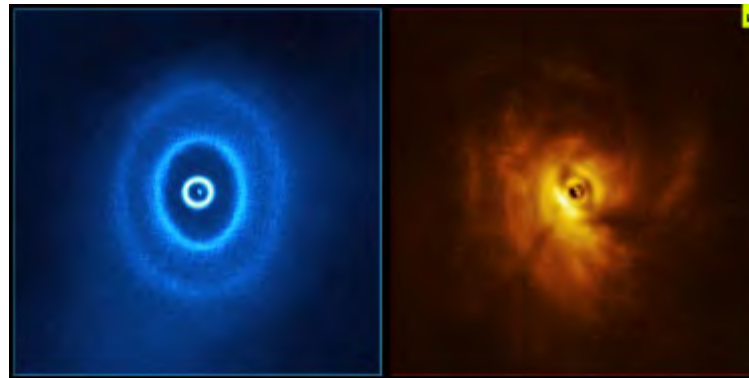


V883 Ori, *Nature*

- Planet formation



- Planet-disk interaction



GW Ori, *Science*