



Europa Lander Science Definition Team Update

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Kevin Hand (JPL), Alison Murray (DRI/UNR), Jim Garvin (GSFC)



Science Definition Team

**Co-Chairs: Alison Murray, DRI/Univ. NV Reno,
Jim Garvin, GSFC; Kevin Hand, JPL**

- Ken Edgett, MSSS
- Bethany Ehlmann, Caltech
- Jonathan Lunine, Cornell
- Alyssa Rhoden, ASU
- Will Brinkerhoff, GSFC
- Alexis Templeton, CU Boulder
- Michael Russell, JPL
- Tori Hoehler, NASA Ames
- Ken Nealson, USC
- Sarah Horst, JHU
- Peter Willis, JPL
- Alex Hayes, Cornell
- Brent Christner, Univ FL
- Chris German, WHOI
- Aileen Yingst, PSI
- David Smith, MIT
- Chris Paranicas, APL
- Britney Schmidt, GA Tech

Planetary scientists, Microbiologists, Geochemists



Science Definition Team

- SDT Charter with mission goals defined:
 - Search for evidence of biomarkers and/or signs of extant life.
 - Assess the habitability (particularly through quantitative compositional measurements) of Europa via in situ techniques uniquely available by means of a landed mission.
 - Characterize surface properties at the scale of the lander to support future exploration.



Science Definition Team

- Key mission parameters:
 - Lander will be launched on a separate mission.
 - Target launch: 2024 on a SLS.
 - Mission carries its own communication relay (Clipper can only be used as a backup).
 - Battery powered mission: 20 day surface lifetime.
 - Spacecraft dry mass on surface is approximately 350 kg with 35 kg allocation for science payload.
 - Threshold includes chemical analyses of 3 samples from 10 cm depth or deeper.



Payload Resource Allocations

	Mass (kg)	Current Volume (cm ³) (MEV)	Total Energy per Mission* (W-hr) (CBE)	Total Data Volume per Mission* (Mbits) (CBE)
Europa Lander Payload	35.0 kg (26.6 kg with 32% margin)	24900 cm ³	2500	2700



Science Trace Matrix (Draft)

- **Goal 1: Search for Evidence of Life on Europa**
 - Investigation 1: Detect and characterize any organic indicators of past or present life.
 - Investigation 2: Identify and characterize morphological and textural indicators of life.
 - Investigation 3: Detect and characterize any inorganic indicators of past or present life.
 - Investigation 4: Determine the provenance of sampled material.
 - Investigation 5: Determine if living organisms persist in sampled material [Not part of Threshold].



Science Trace Matrix (Draft)

- **Goal 2:** Assess the habitability of Europa via in situ techniques uniquely available to a lander mission.
 - Investigation 1: Characterize the non-ice composition of Europa's near-surface material and determine whether there are indicators of chemical disequilibrium and other components essential for life.
 - Investigation 2: Determine the proximity to liquid water at the lander's location.
 - Investigation 3: Detect whether Europa is active today and characterize any observable surface exchange processes to support sample context.



Science Trace Matrix (Draft)

- **Goal 3:** Characterize surface properties at the scale of the lander to support future exploration.
 - Investigation 1: Characterize the biosignature preservation potential (BPP) of accessible surface materials at the landing site.
 - Investigation 2: Characterize the surface dynamics of Europa at the landing site in all three dimensions.
 - Investigation 3: Characterize the material properties of Europa at the landing site.



Questions?



Backup

Schedule

