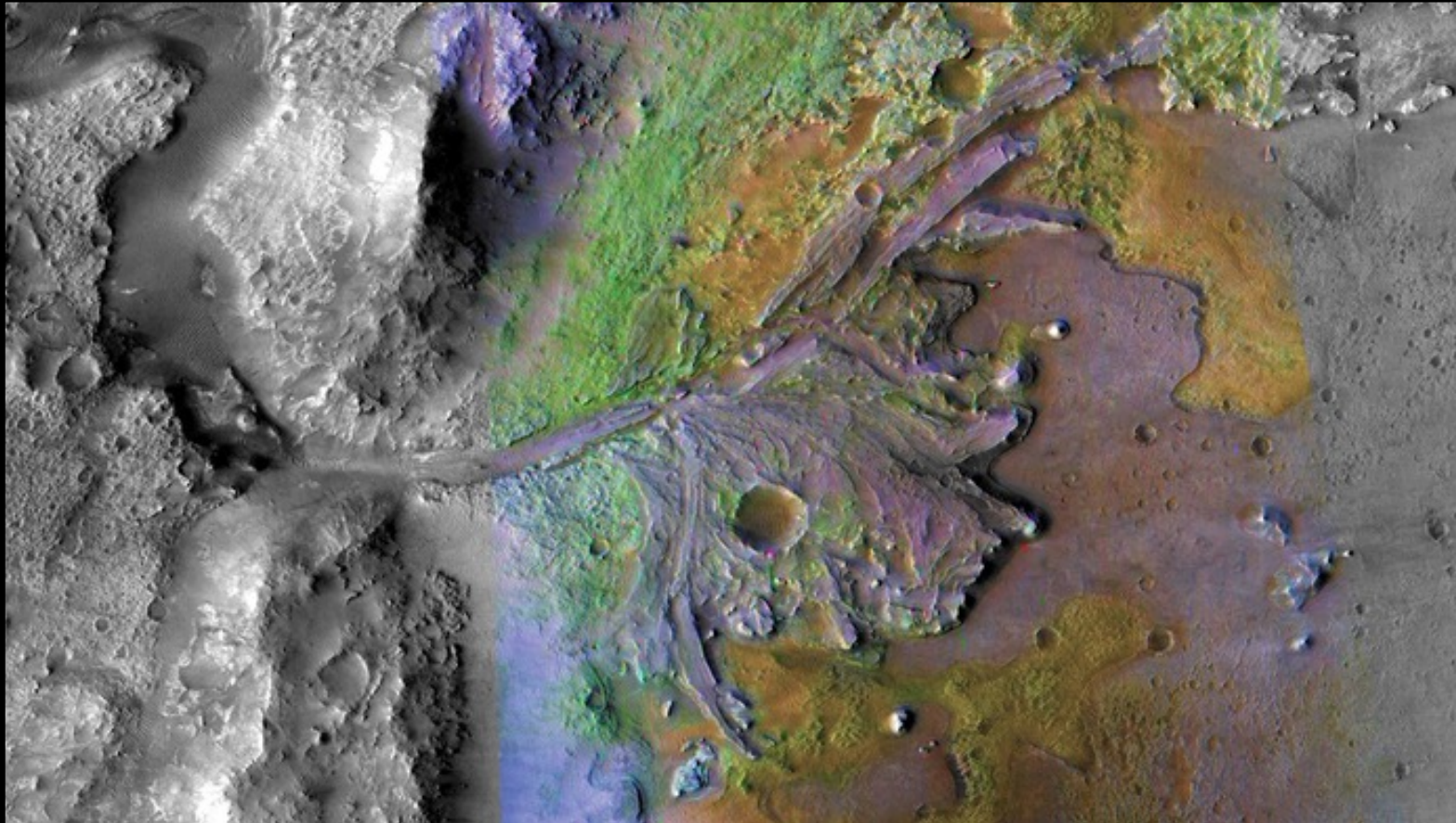
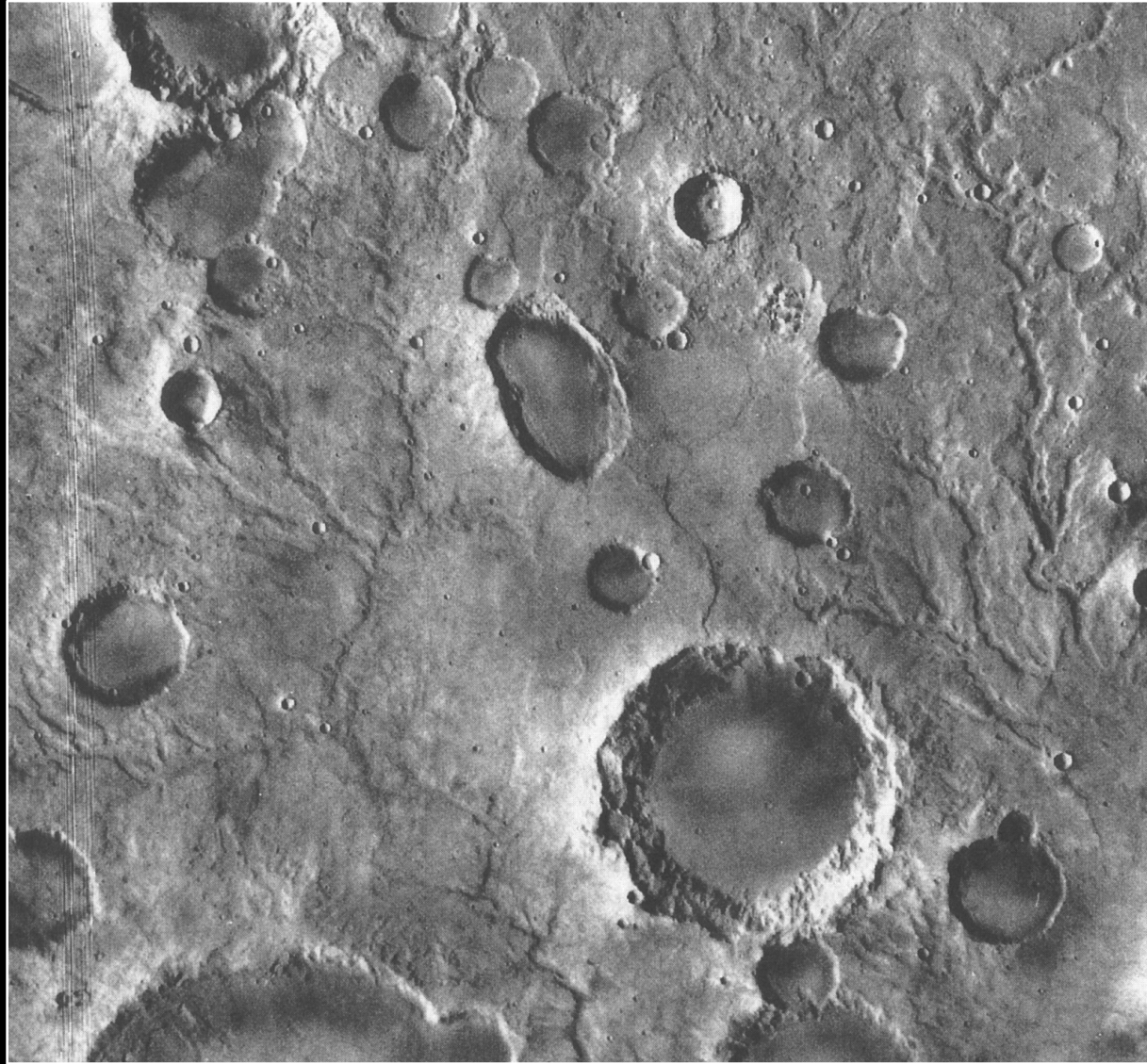


The Search for Signs of Early Life and Prebiotic Processes by the Perseverance Rover Mission



1 km 

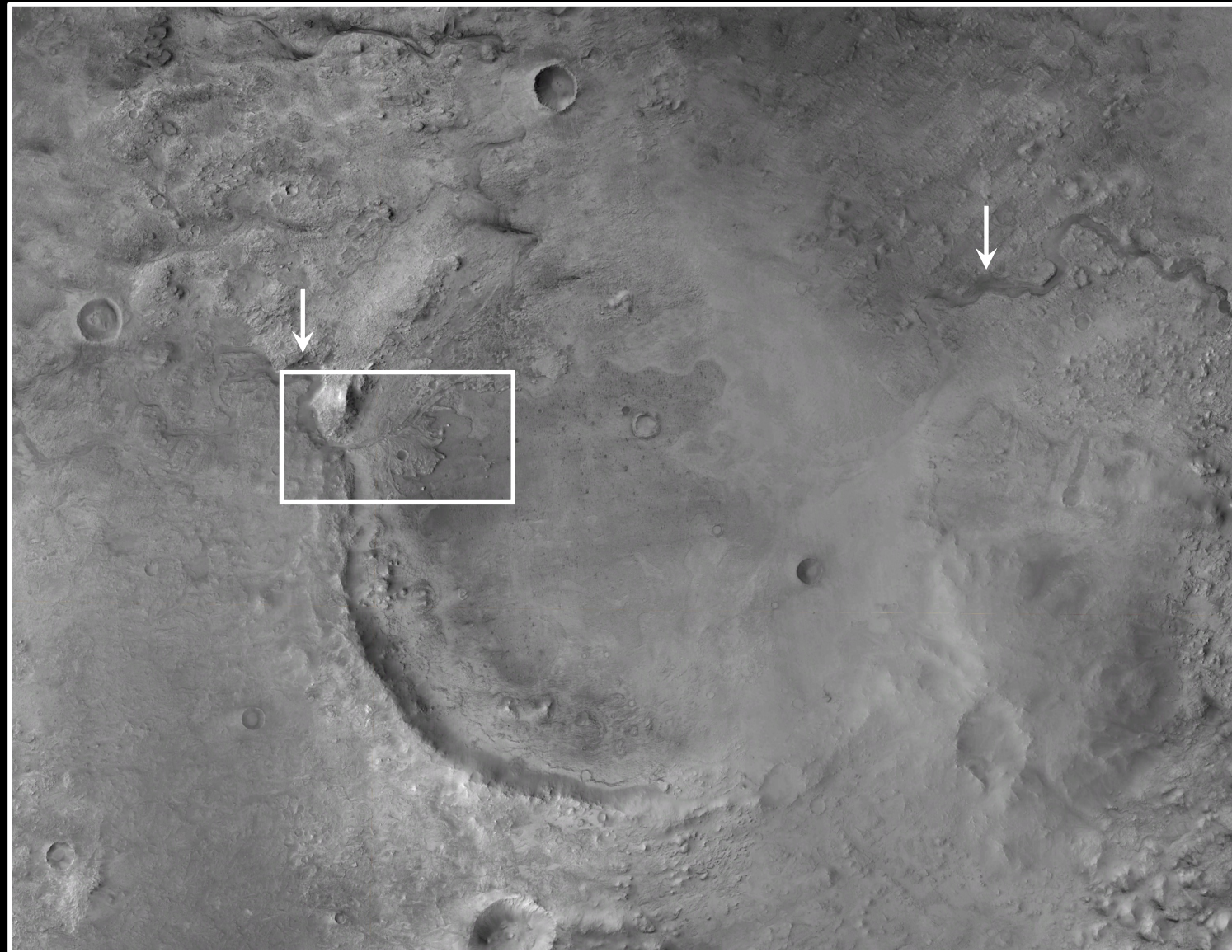
Viking Orbiter Image of Margaritifer Terra



30 km

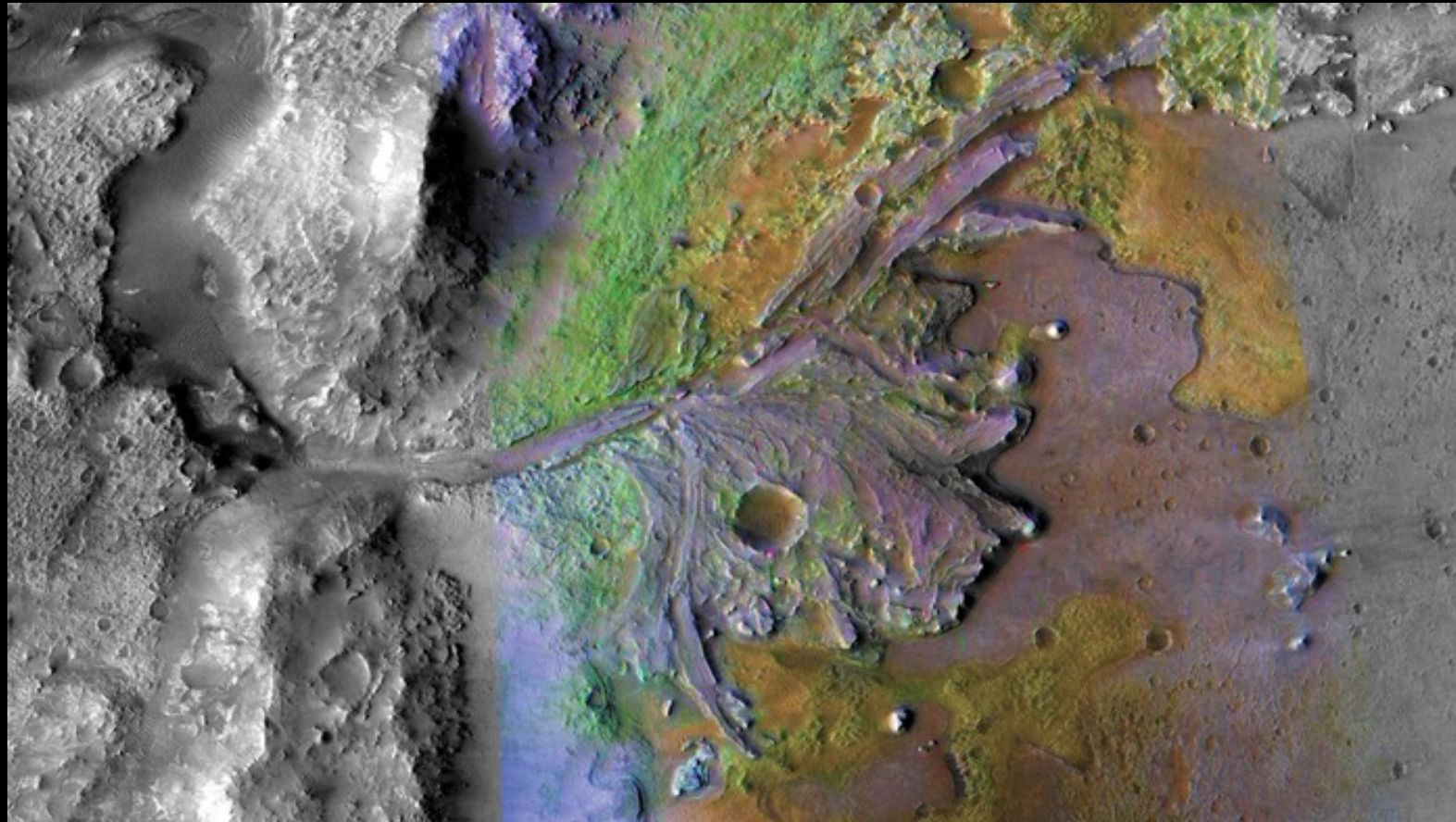
Carr (1997)

Ancient Lake in Jezero Crater





5 km

Minerals in Jezero Delta

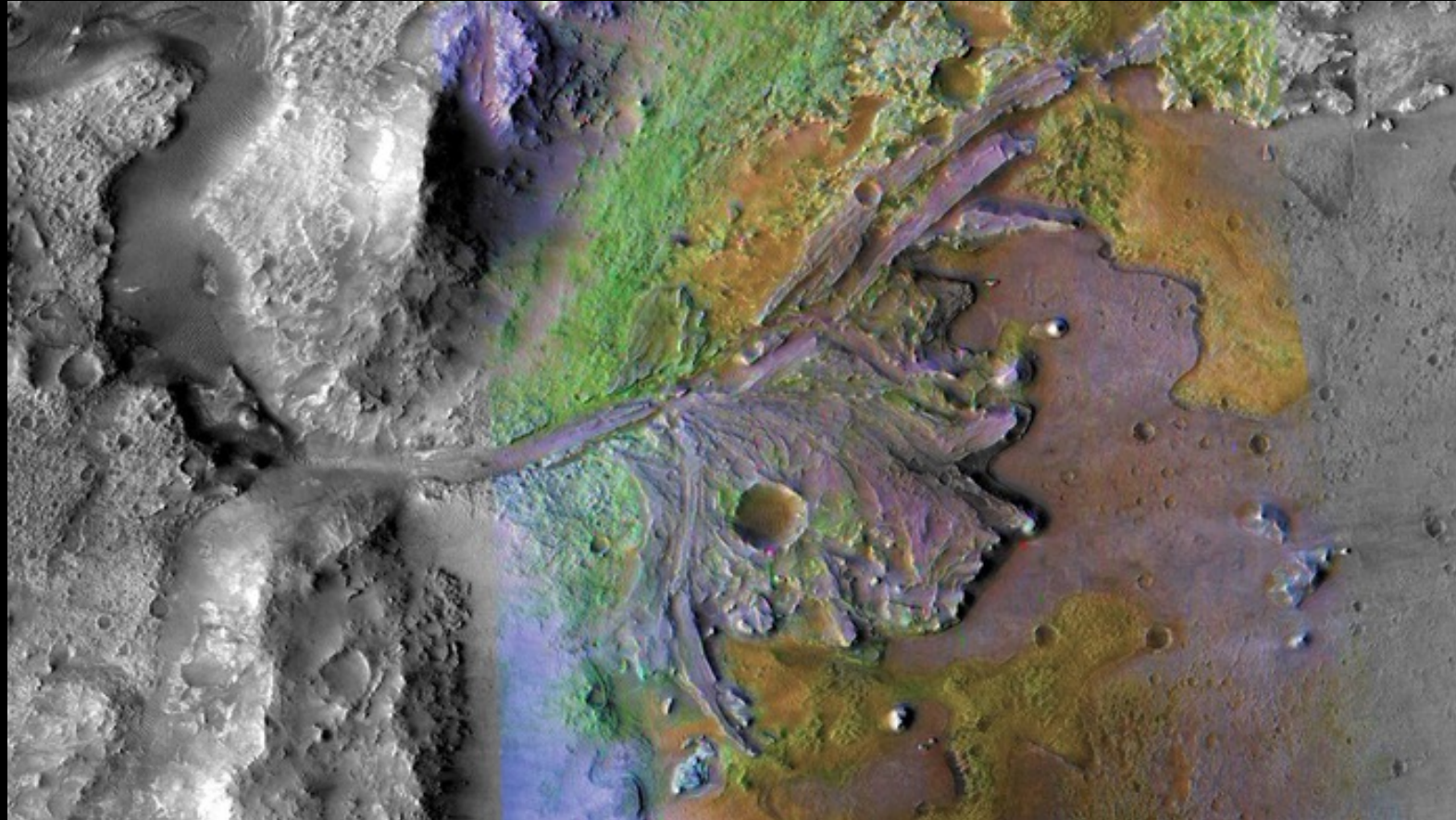



olivine

 
Fe/Mg smectite
carbonate

1 km 

Rocks and Minerals That Can Preserve Organic Matter and Biosignatures



olivine



Fe/Mg smectite
carbonate



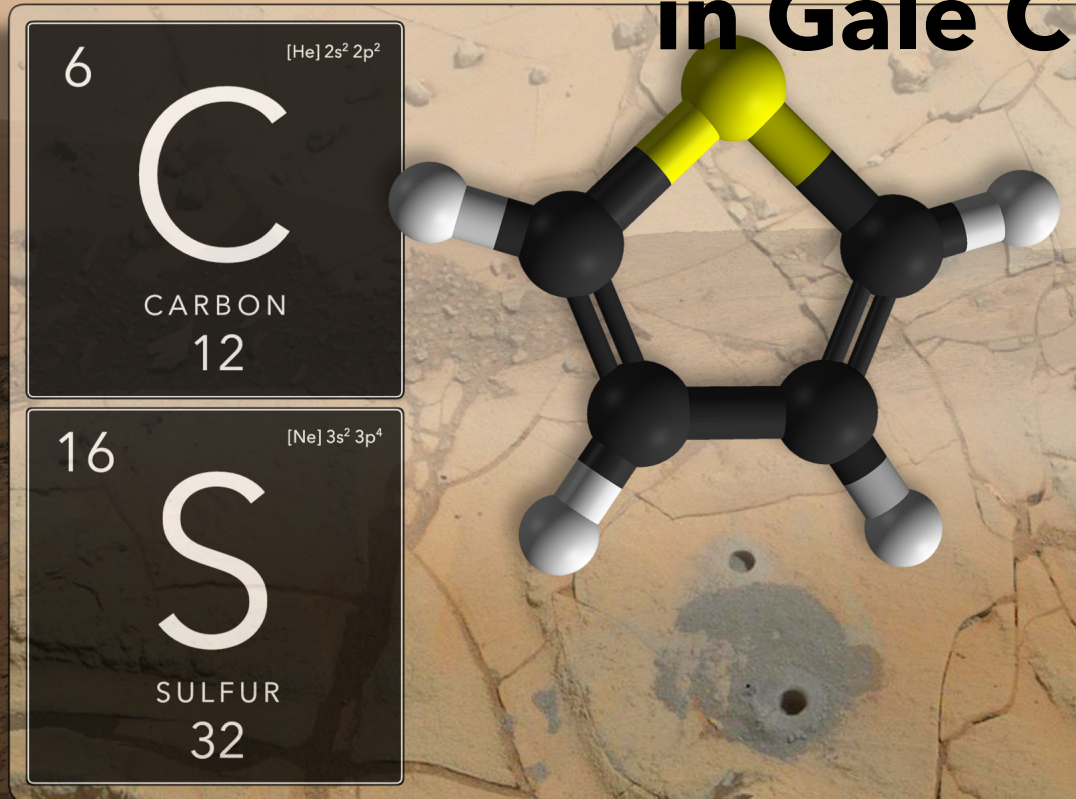
1 km 

Magnesium Carbonate Minerals Around a Modern Lake

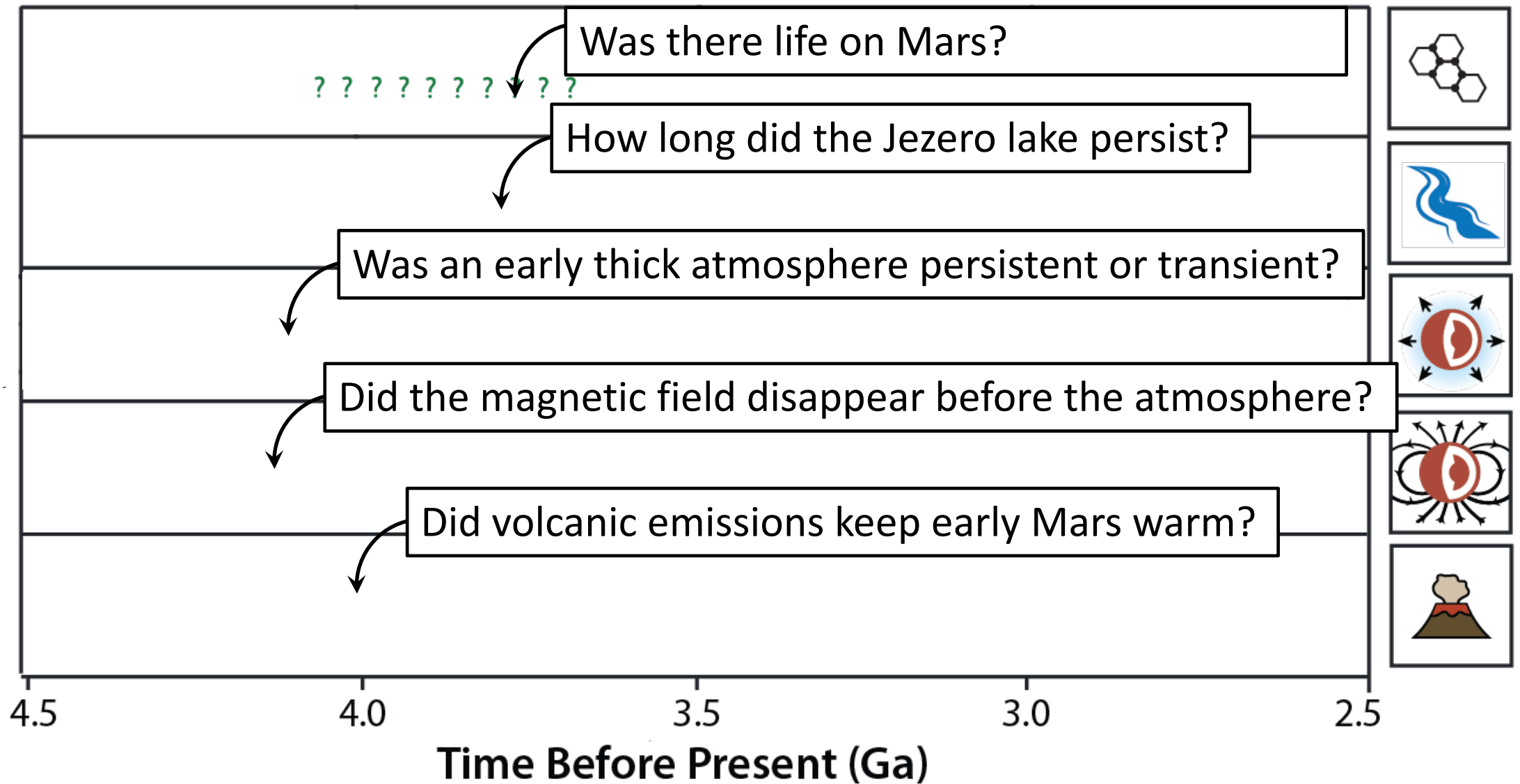


Balci et al. (2020), Bosak et al. (2021)

Organics Present in Lacustrine Mudstones in Gale Crater

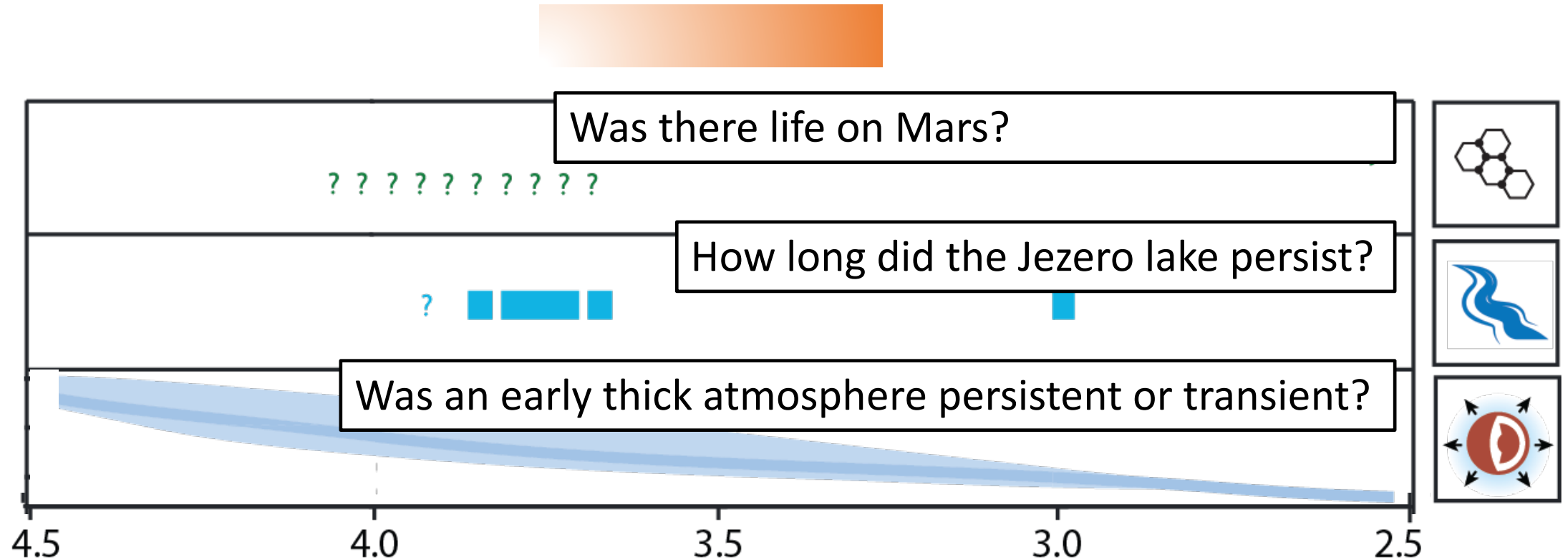


Timing and Nature of Martian Geologic Processes

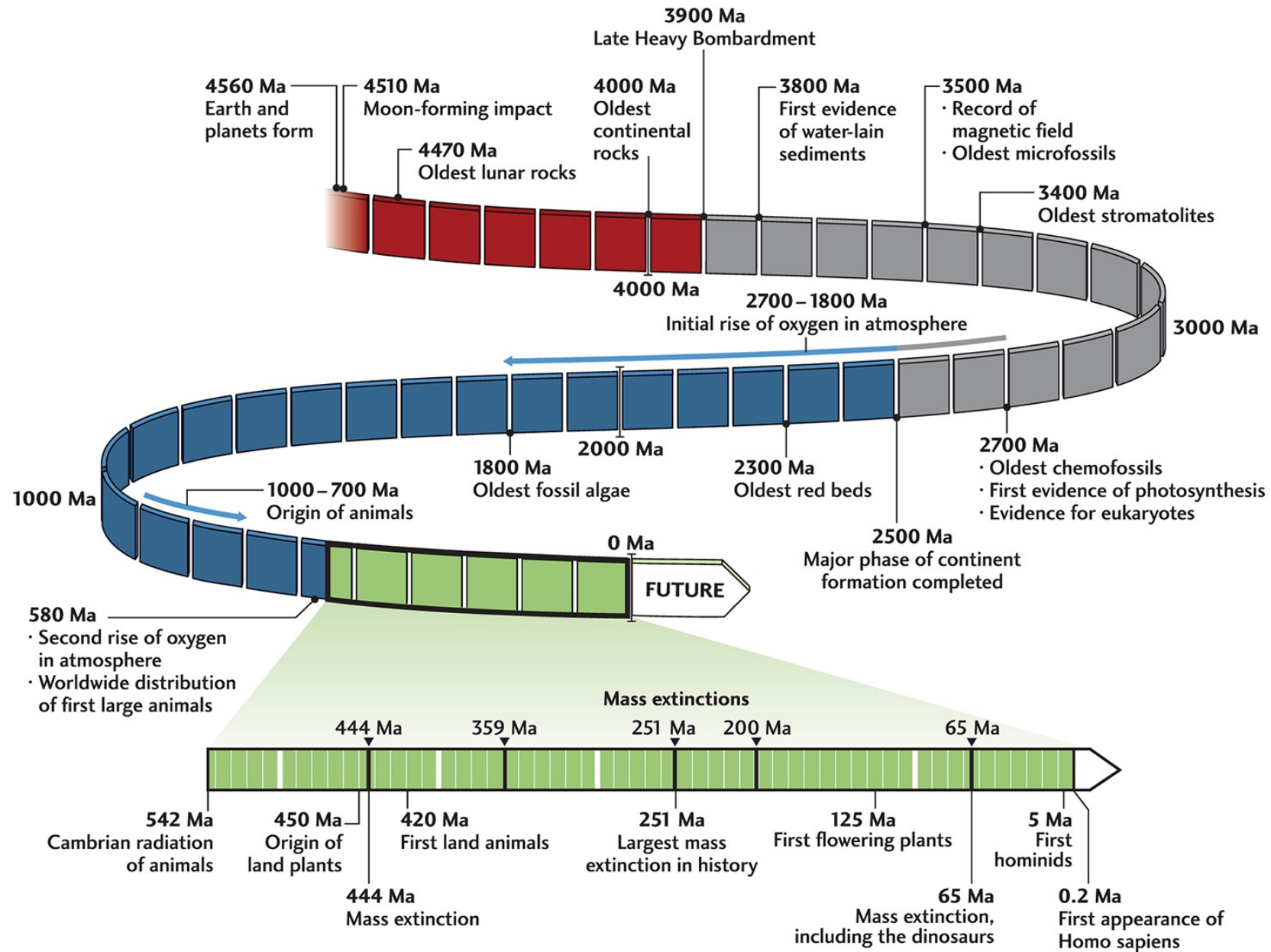


After Ehlmann et al. (2016)

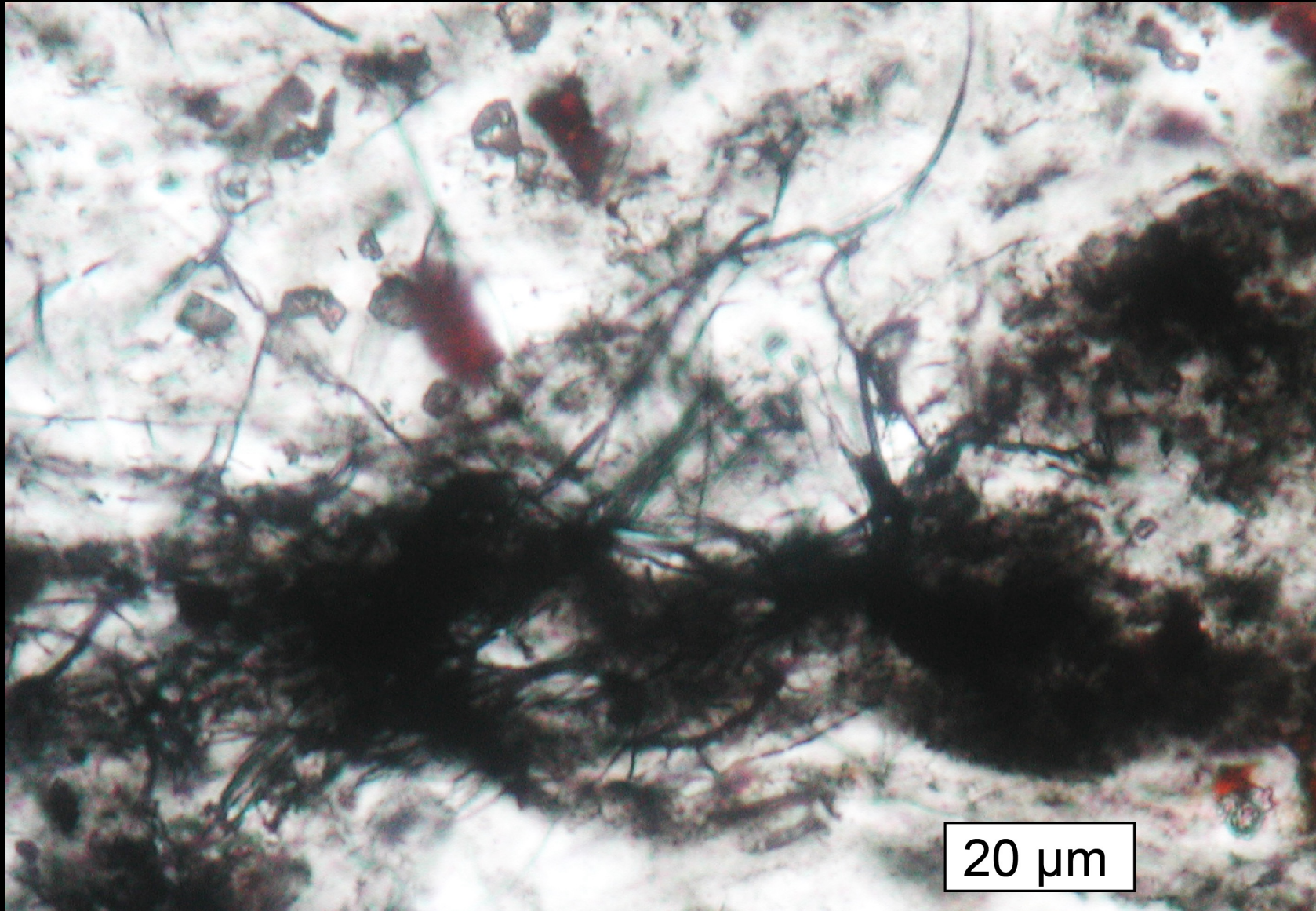
Collecting Samples for Astrobiology



After Ehlmann et al. (2016)



3.47 Ga Silicified Microbial Mats



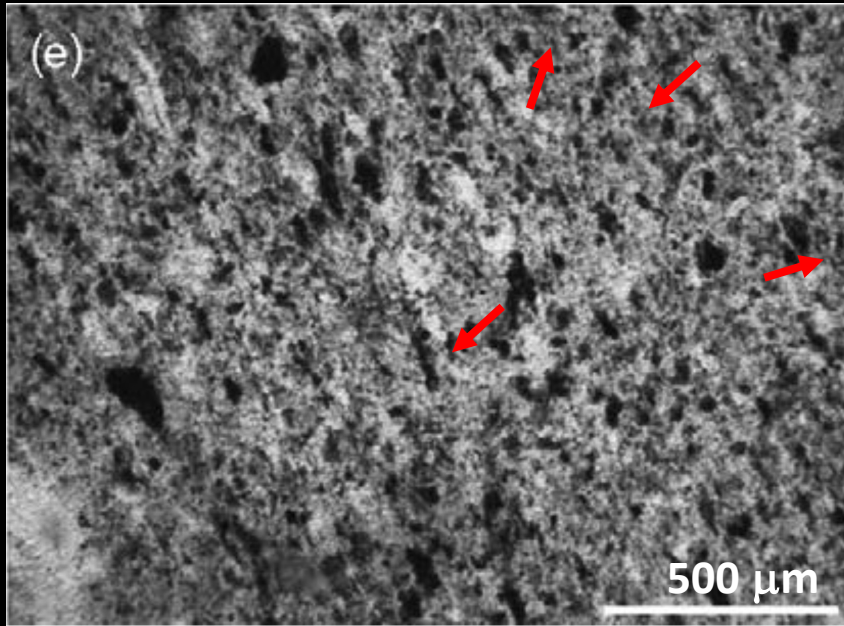
(Homann, 2019)

3 Billion Year-Old Stromatolites

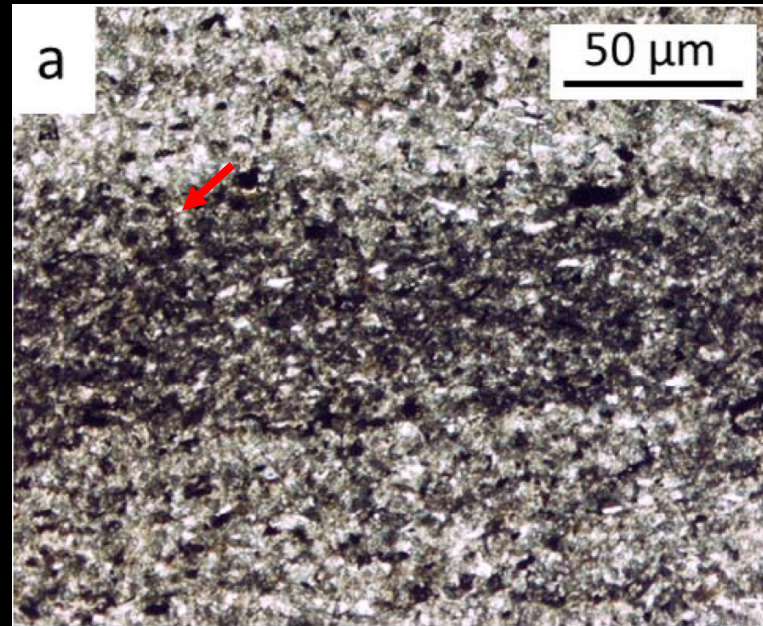


(Petroff et al., 2010; 2013; Bosak et al., 2009; 2010; 2012; 2013; 2021; Daye et al., 2019)

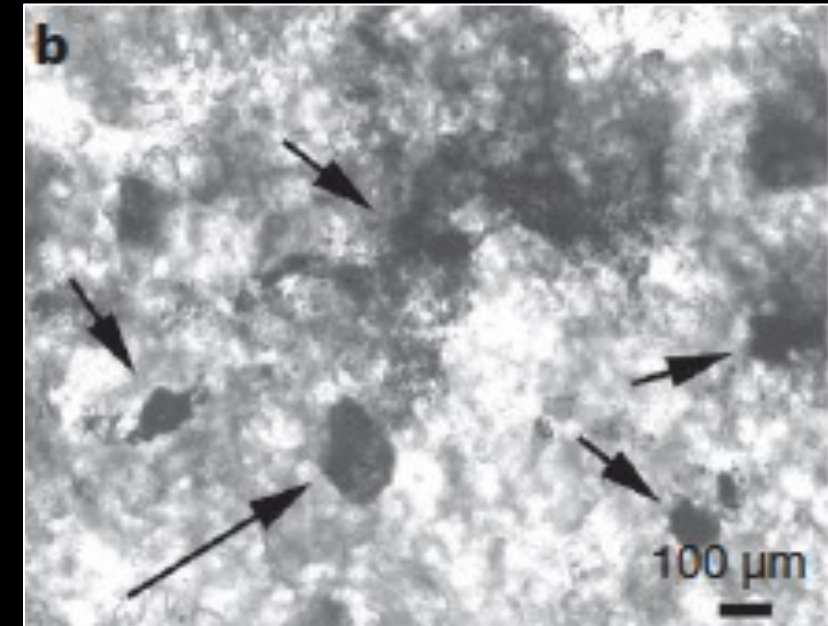
Organic Preservation in Rocks That Contain Rapidly Deposited Fine-Grained Minerals



3.25 Ga shales
Fig Tree Group (Hofmann, 2005)

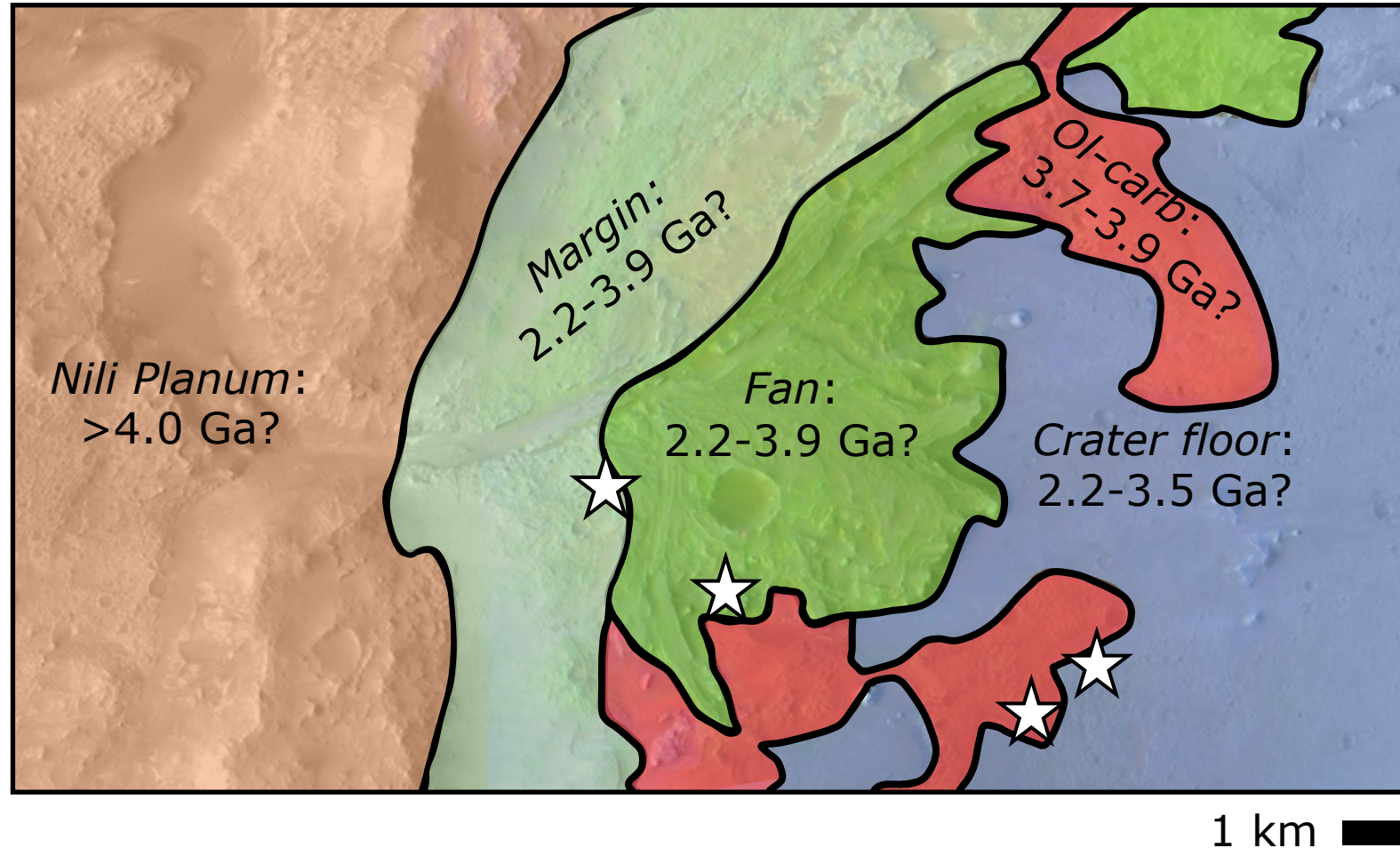


~3.0 Ga siltstone
Lalla Rookh (Stüeken and Buick, 2018)



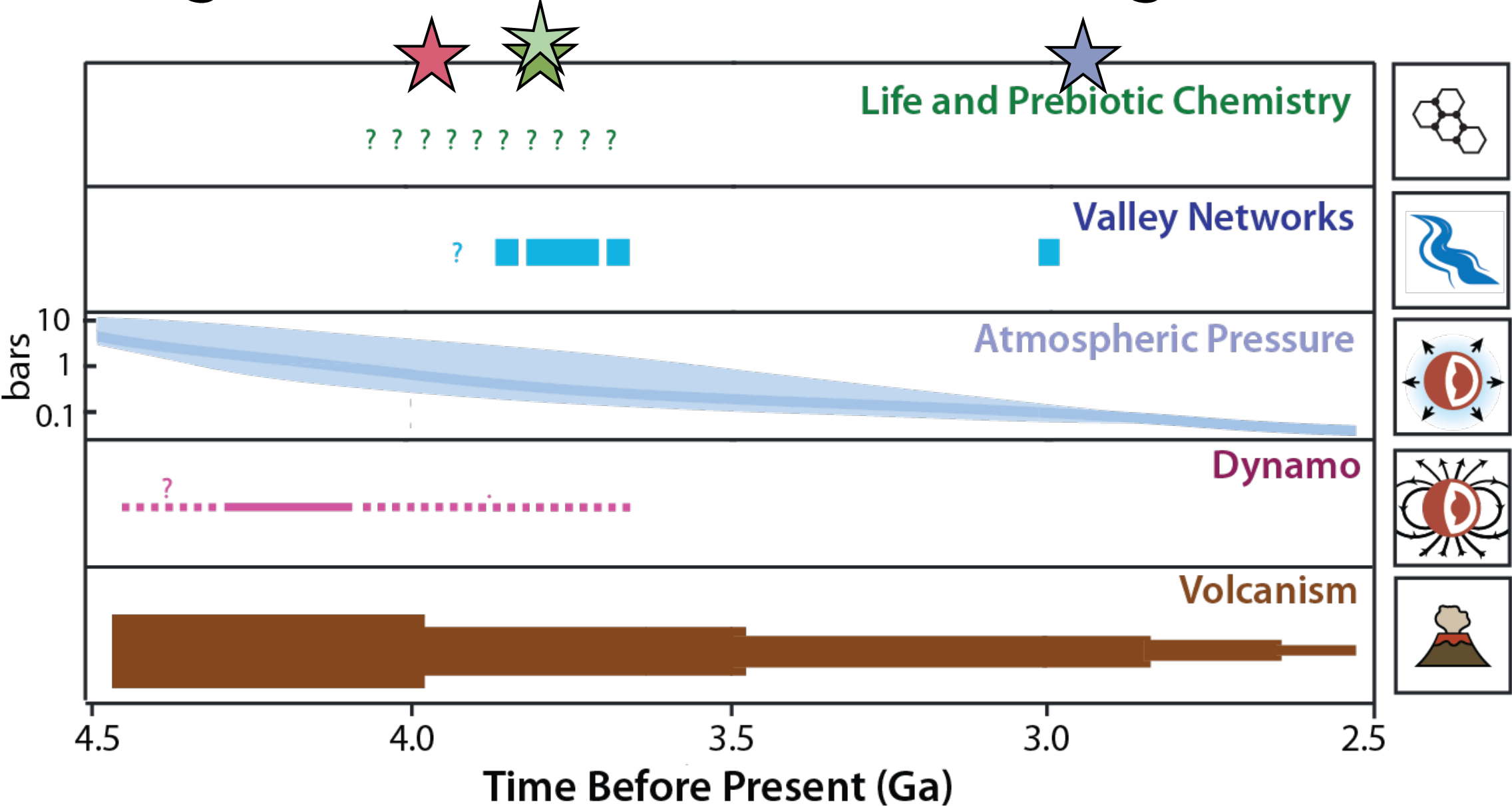
3.2 Ga Moodies Group
(Javaux et al., 2010)

Units Sampled and Their Ages



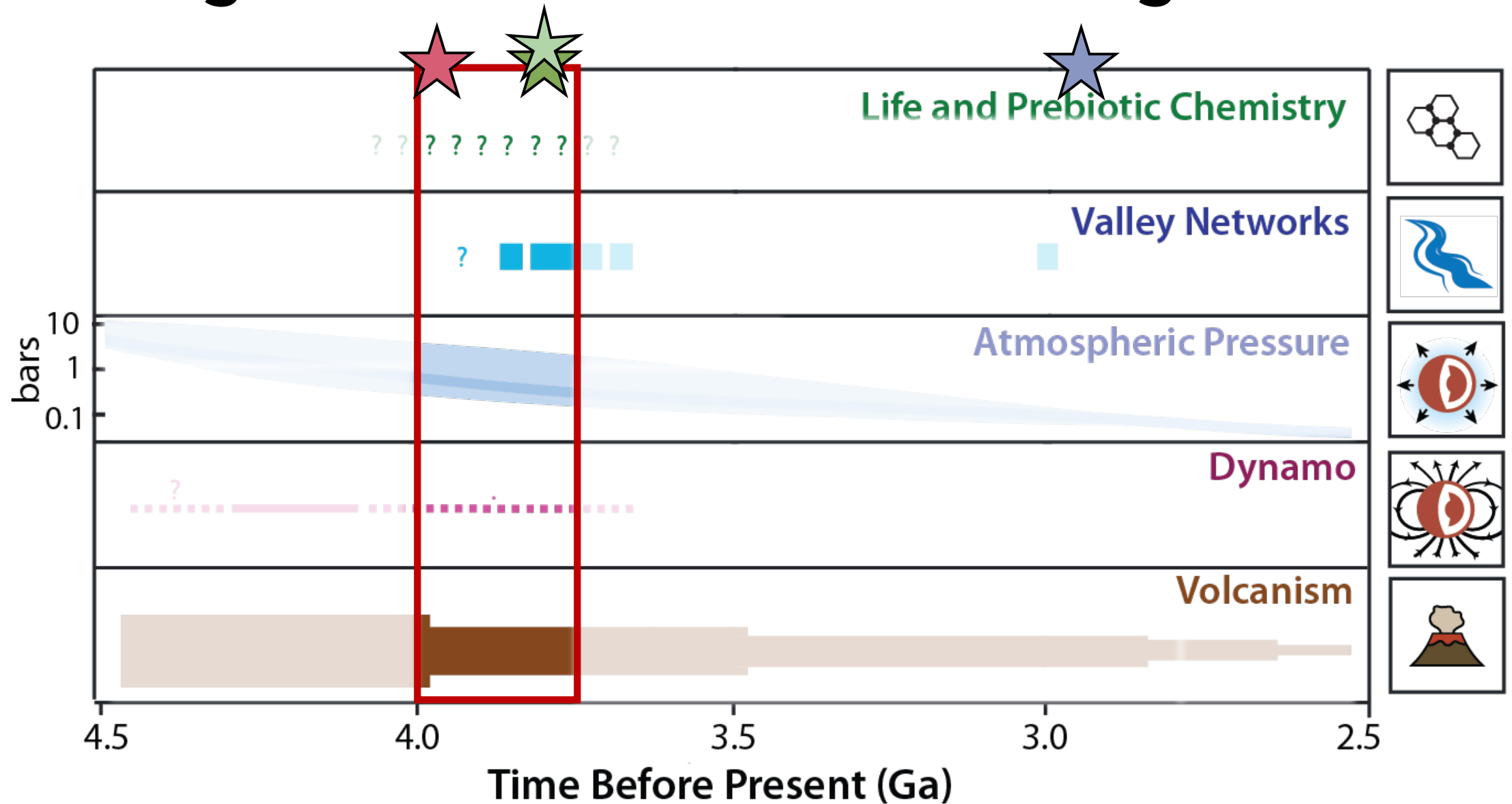
Ga = billions of years old

Timing and Nature of Martian Geologic Processes



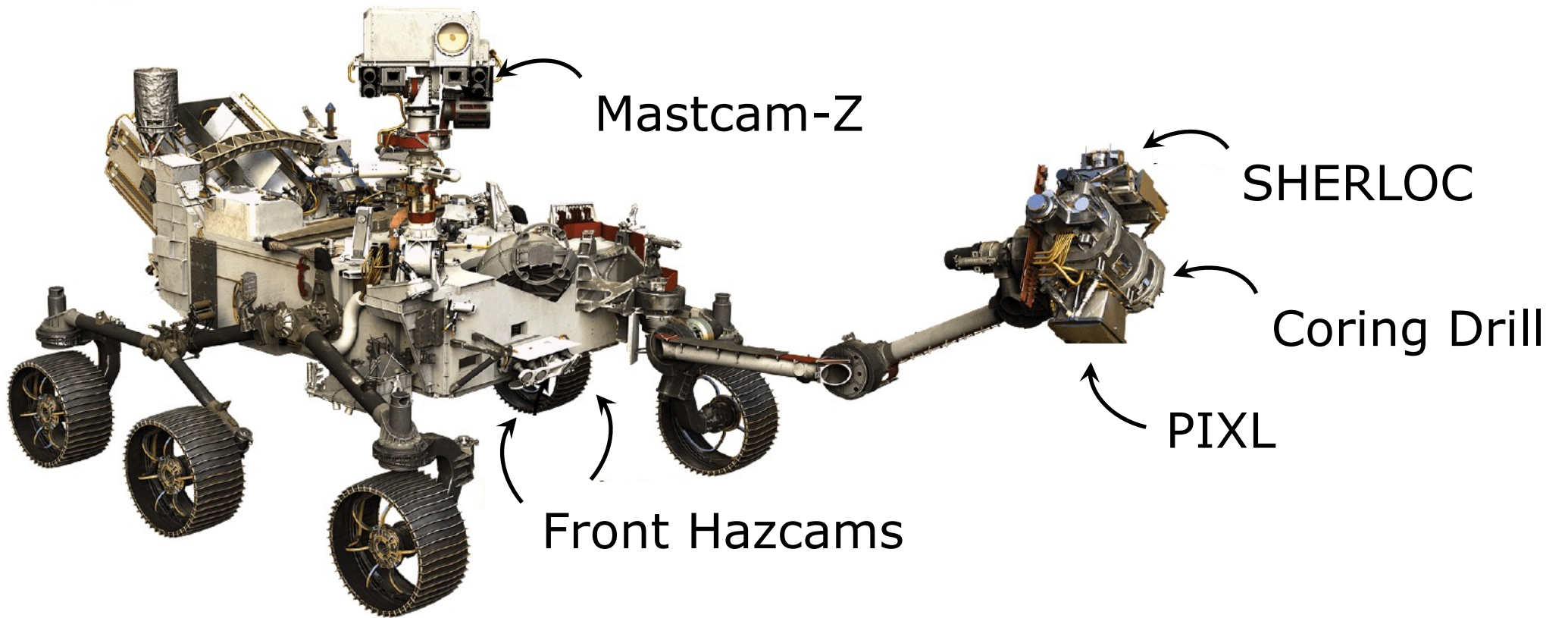
After Ehlmann et al. (2016)

Timing and Nature of Martian Geologic Processes



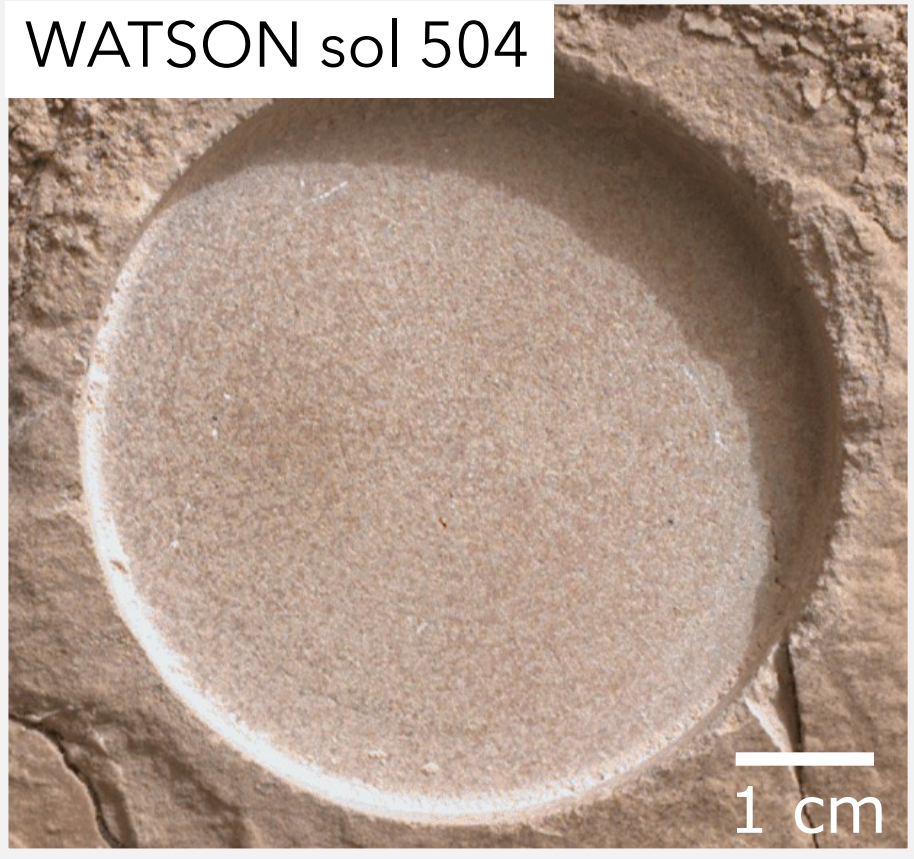
After Ehlmann et al. (2016)

Rover Payload

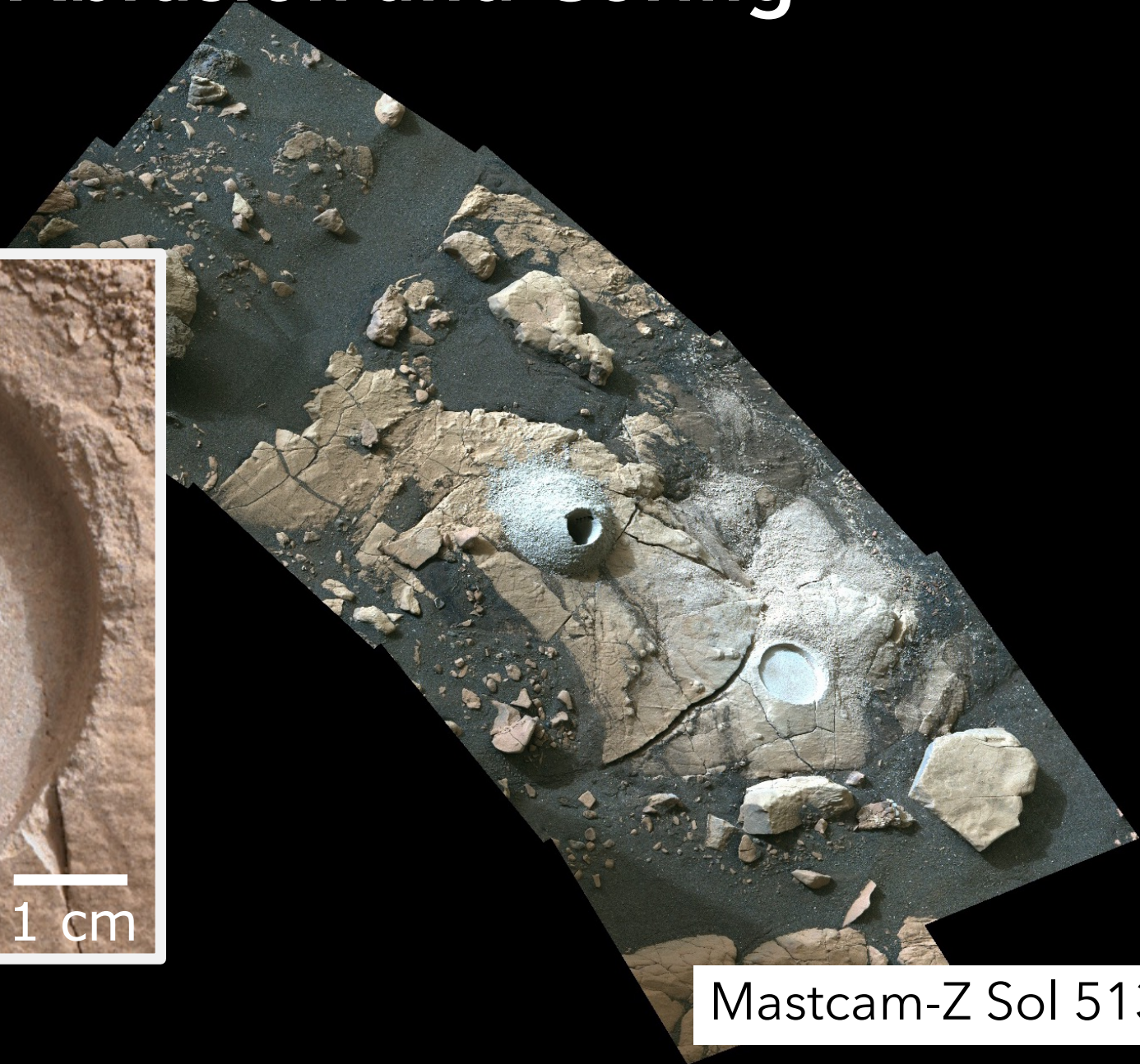


Abrasion and Coring

WATSON sol 504



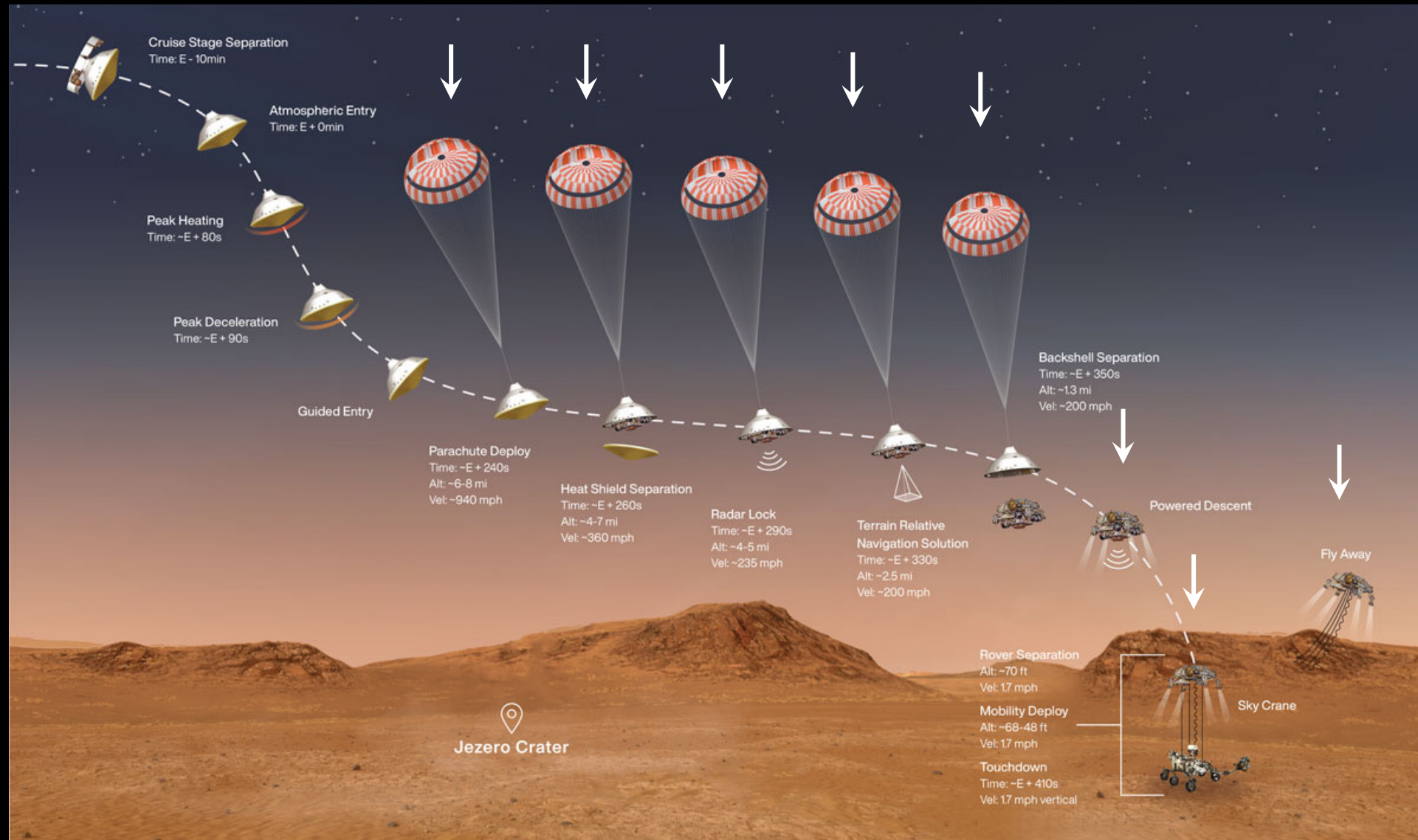
1 cm



Mastcam-Z Sol 513



Entry, Descent, and Landing



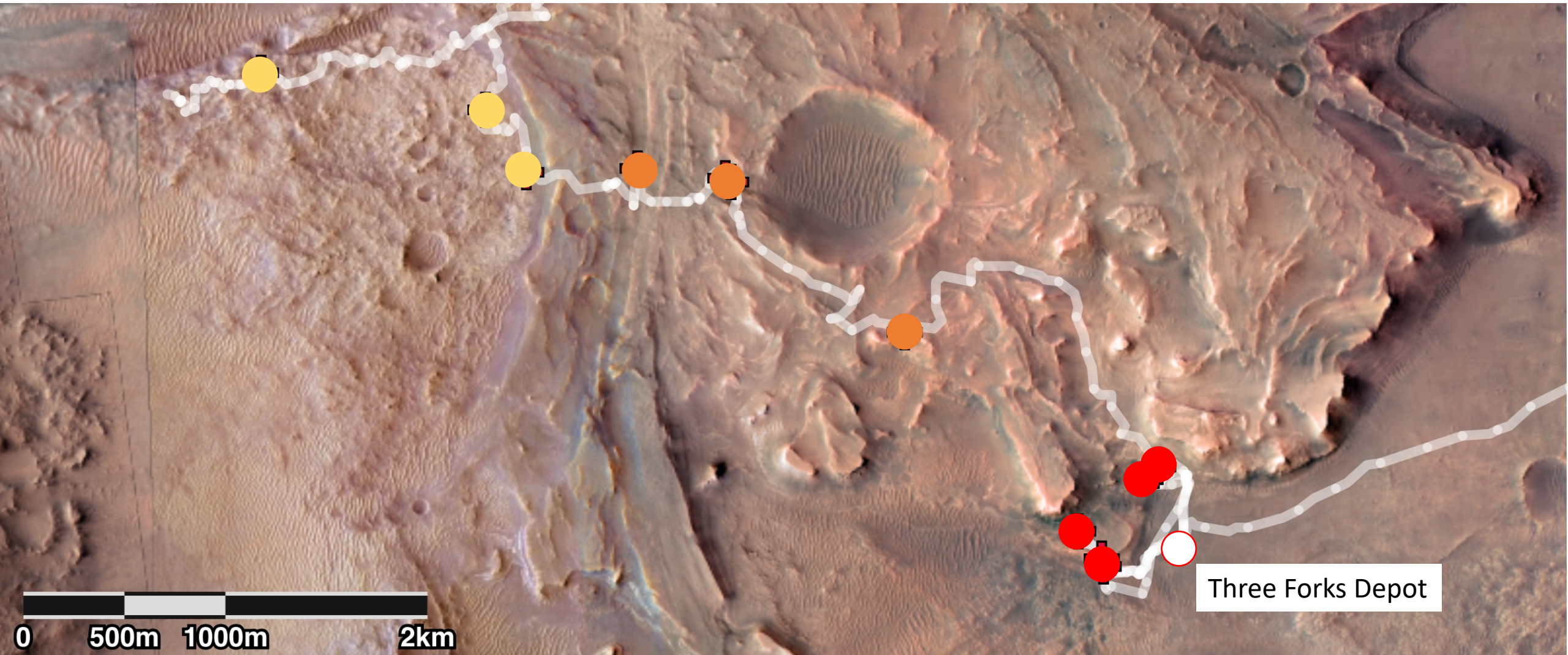
Mars 2020 Landing Video



Sampling Path

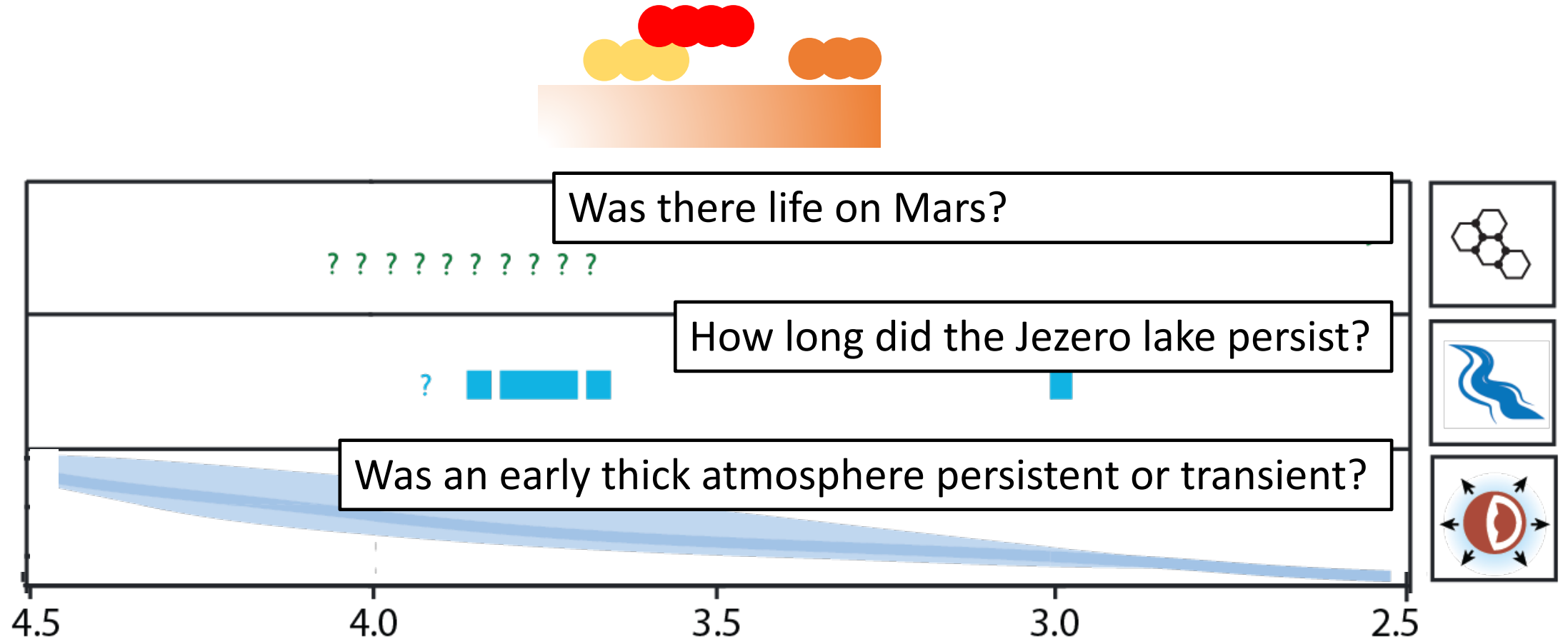


Sedimentary Rocks From the **Fan** and the **Margin**



Mostly sandstones, most contain carbonate, some also contain silica
Fine-grained sulfate-rich rocks at the fan front

Collected Samples and Astrobiology



After Ehlmann et al. (2016)

Summary

- Mars 2020 has acquired 21 oriented cores of bedrock
- First samples of extraterrestrial sedimentary rocks that were deposited by water
- No clear evidence yet for organic matter or fossils
- Samples that can enable the search for past life and life's early origins
- Updated estimates of carbonate abundances in olivine-rich regions may allow for a warmer early Mars
- Preservation of biosignatures in Fe/Mg-rich carbonates?

