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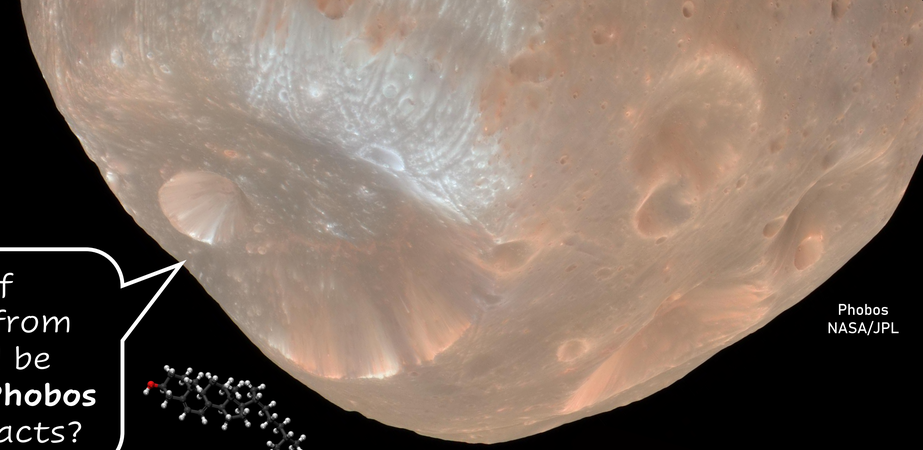
MARS' MOON PHOBOS:

A BETTER PLACE TO SEARCH FOR MARTIAN LIFE THAN MARS ITSELF?

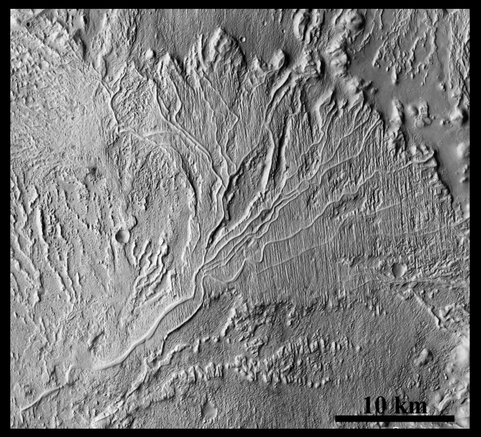
ZOE MORLAND



Phobos
NASA/JPL

LIFE ON MARS?

- Remote and in-situ investigation have revealed evidence of past water flows on Mars (right).
- Liquid water is vital for life, at least on Earth, the only known location of life in our Solar System.
- Therefore, billions of years ago Mars may have been habitable and life could have developed.
- Organisms can leave behind breakdown products when they die, e.g. amino acids & lipids, known as biomarkers, which can be preserved for billions of years.
- Evidence of these on Mars are yet to be found...

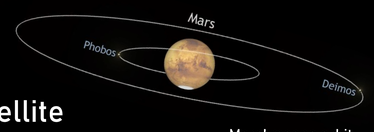


Inverted channel near 6.2° S 151.6° E, Mars Reconnaissance Orbiter Image [1]

*...What if **biomarkers** from Mars could be delivered to **Phobos** through impacts?*

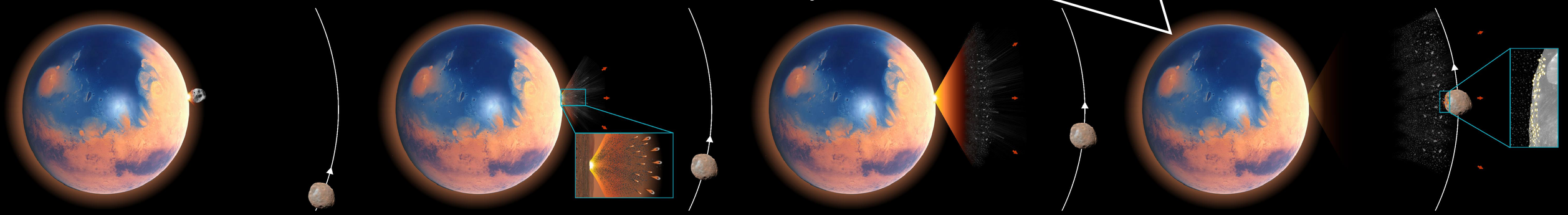
BIOMARKERS ON PHOBOS?

Phobos orbits Mars closer than any other satellite to its primary in the Solar System. Therefore...



Mars' moons orbit
Ade Ashford

*...If a large impact were to occur in an area where biomarkers have been preserved, these biomarkers could be transferred into the ejecta and possibly be **deposited onto Phobos** [2-4].*



Initial impact into Mars → Martian ejecta ascends through atmosphere → Martian ejecta spreads upwards towards the orbit of Phobos → Deposition of ejecta onto Phobos

All-Axis Light-Gas Gun at the OU fires mm sized projectiles at several km s^{-1}

HOW CAN THIS BE TESTED?

A series of impact and heating experiments to simulate each stage of the transfer process above

INITIAL MARS IMPACT

Fire inert projectile into martian analogue rock doped with biomarkers. Collect ejecta from impact

AERODYNAMIC HEATING FROM MARS' ATMOSPHERE

Apply heat to collected ejecta material from the impact

DEPOSITION ONTO PHOBOS

Fire this processed ejected material into Phobos regolith simulants and assess the survivability of the biomarkers

The results from this project will shed light on the feasibility of biomarker transfer from Mars to Phobos.

*If feasible, then future missions such as **Japan's Martian Moons eXploration** could return samples containing biomarkers from Mars [5-6]*

UKRI Research England | UKRI Science and Technology Facilities Council | UK SPACE AGENCY

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References: [1] Burr et al (2009) Nat. Acad. Sci. Eng. & Med. [2] Murray (2011) Proc. EPSC-DPS. 6. 1003. [3] Ramsley and Head (2013) Planet. & Space Sci. 87. 115-129. [4] Chappaz et al. (2013) Astrobiology. 13(10). [5] Bertrand et al. (2019) 15th ASTRA.[6] Usui et al. (2019) 50th LPSC. [7] Kminek & Bada et al. (2006) Earth & Plan. Sci. 245(1-2). 1-5.