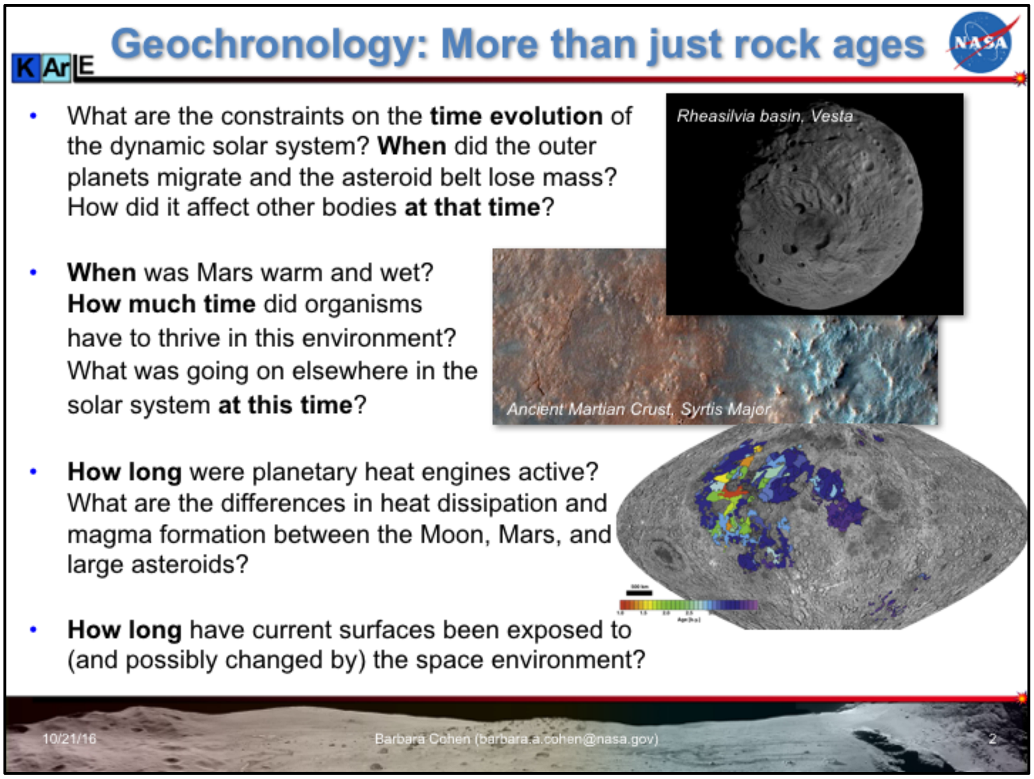
The Potassium-Argon Laser Experiment (KArLE): *In Situ* Geochronology for Planetary Robotic Missions

Barbara A. Cohen

NASA Marshall Space Flight Center,
Huntsville AL 35812
(Barbara.A.Cohen@nasa.gov)

Image created under contract to Cohen



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Syrtis Major is from Ehlmann, B. L., et al. (2009), Identification of hydrated silicate minerals on Mars using MRO-CRISM: Geologic context near Nili Fossae and implications for aqueous alteration, *J. Geophys. Res. Planets*, *114*. – Fair use
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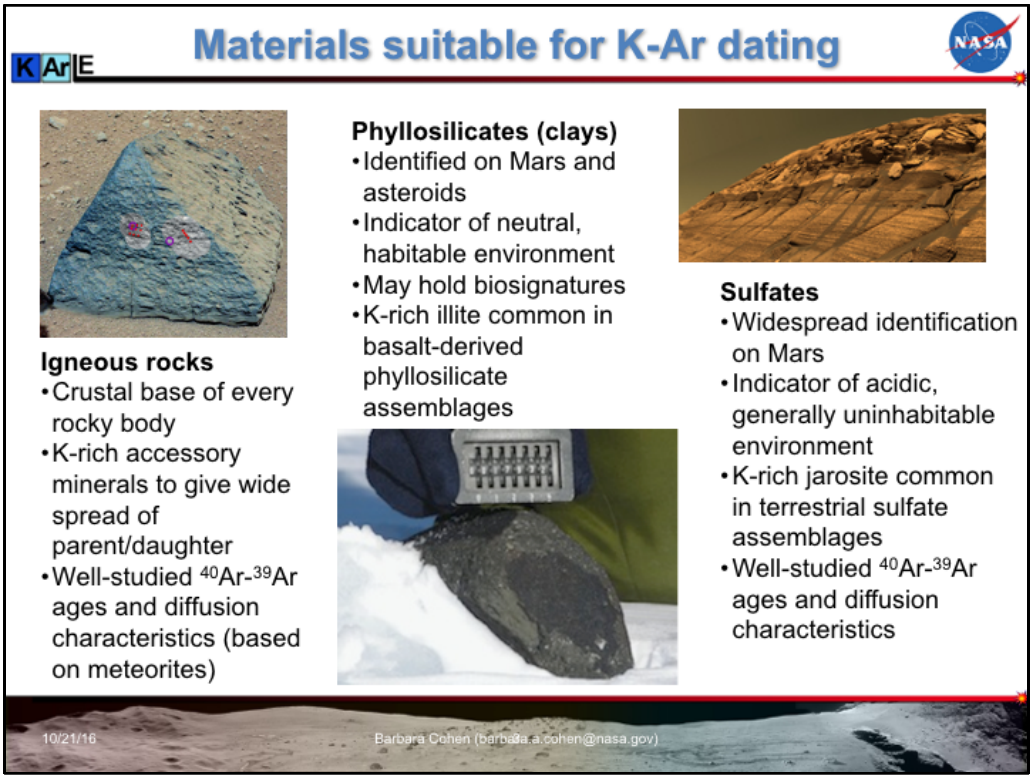

http://mars.nasa.gov/mer/gallery/press/opportunity/20041213a.html
http://www.nasa.gov/topics/solarsystem/features/life-components.html
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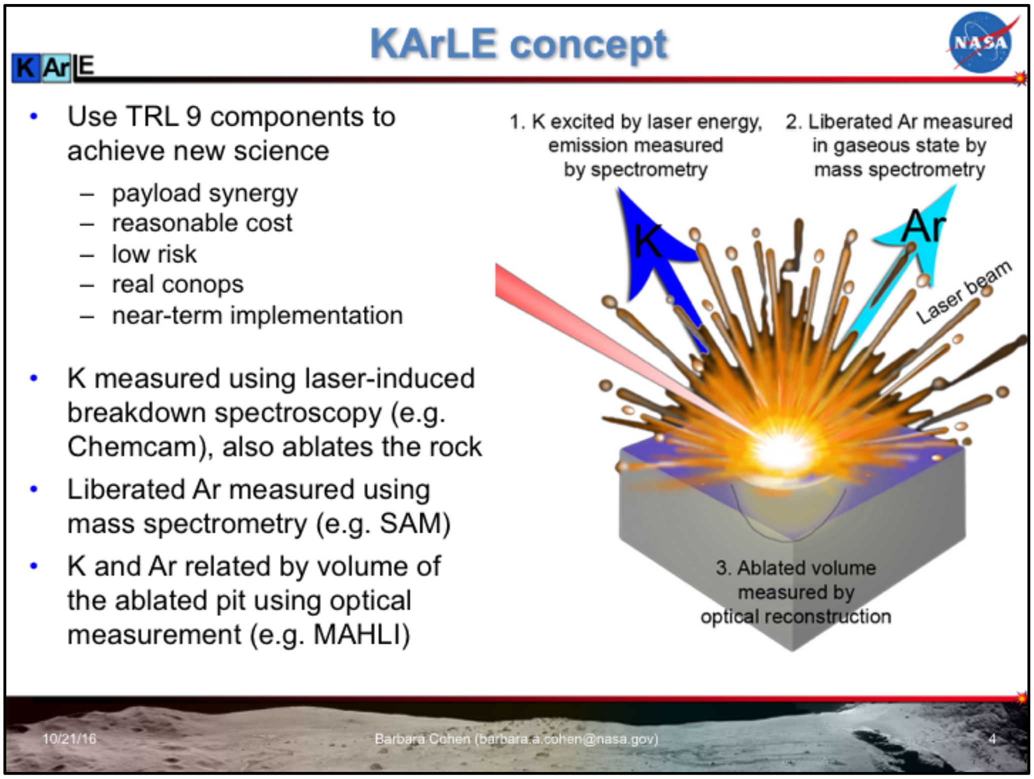

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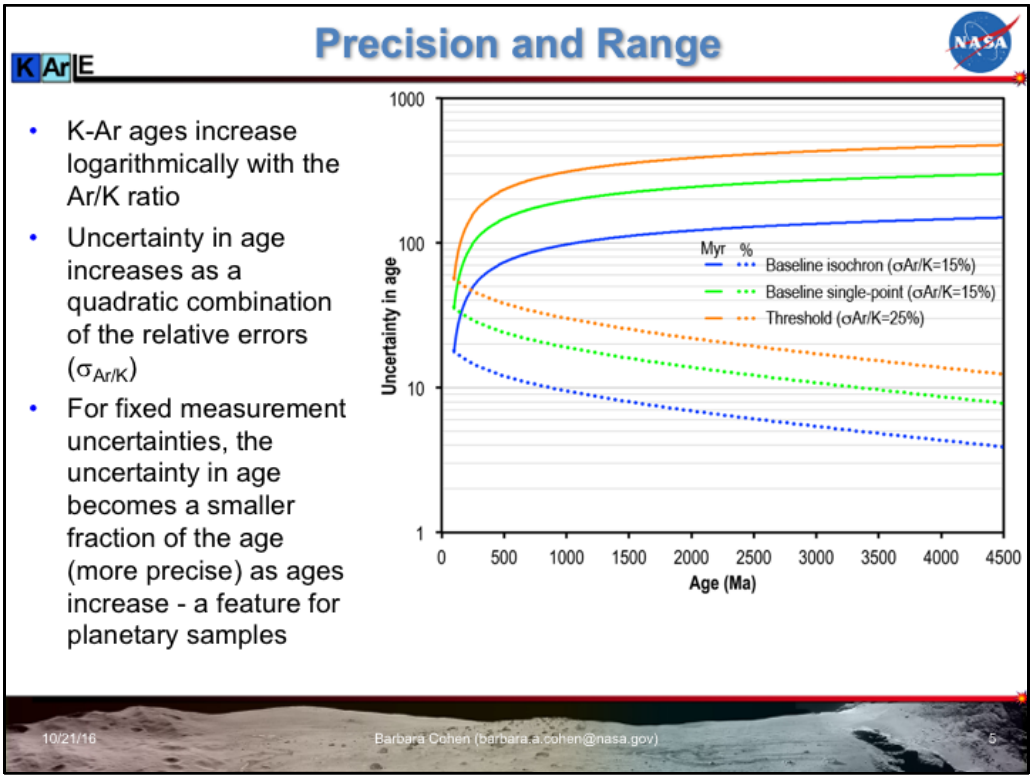

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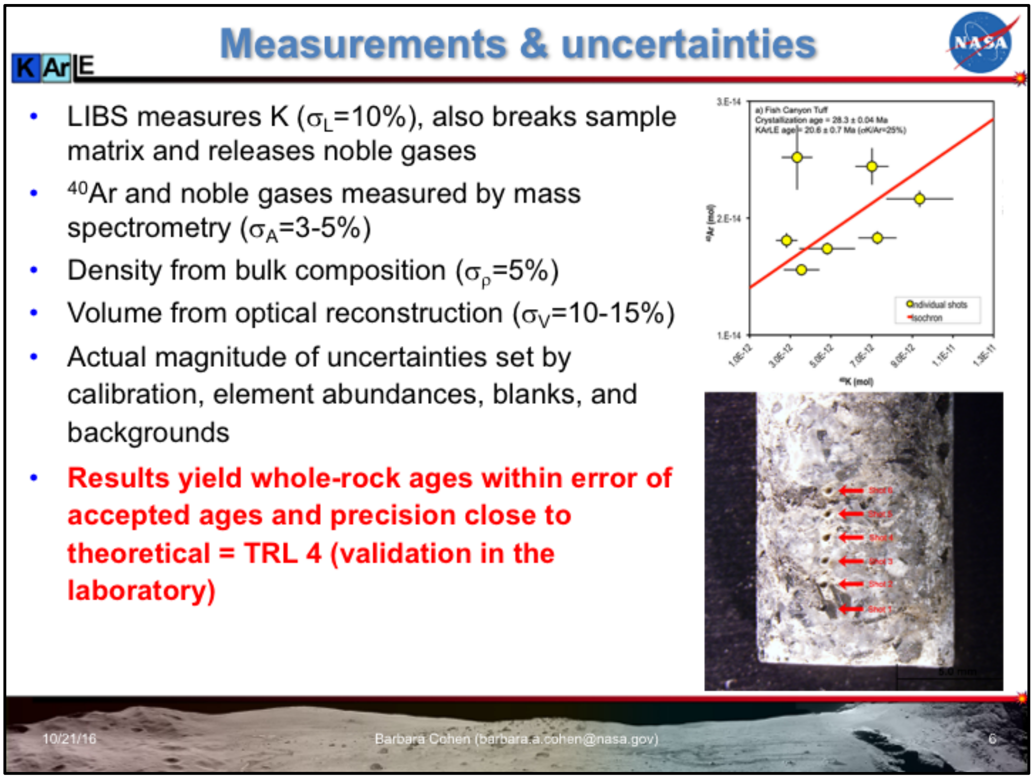

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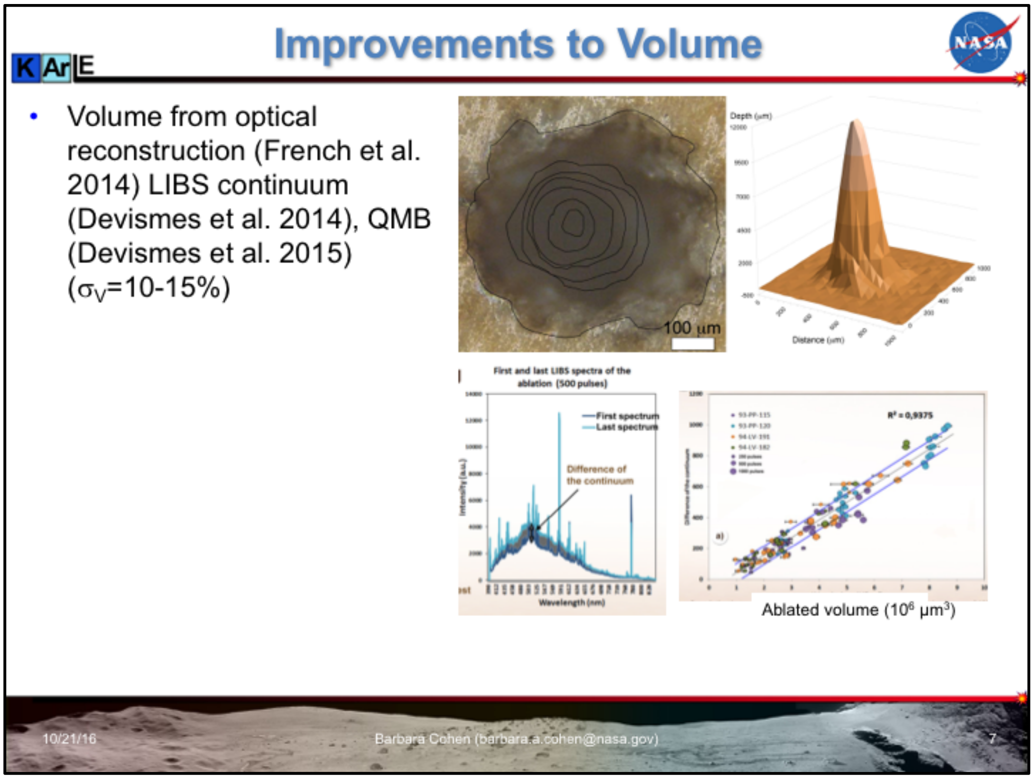

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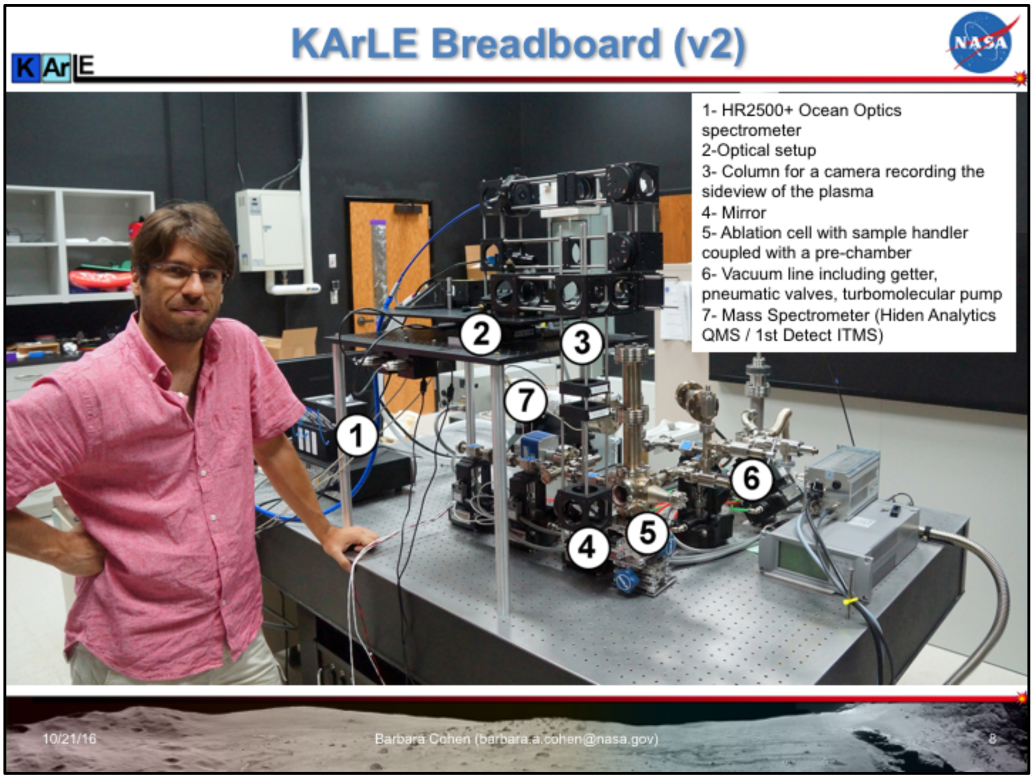

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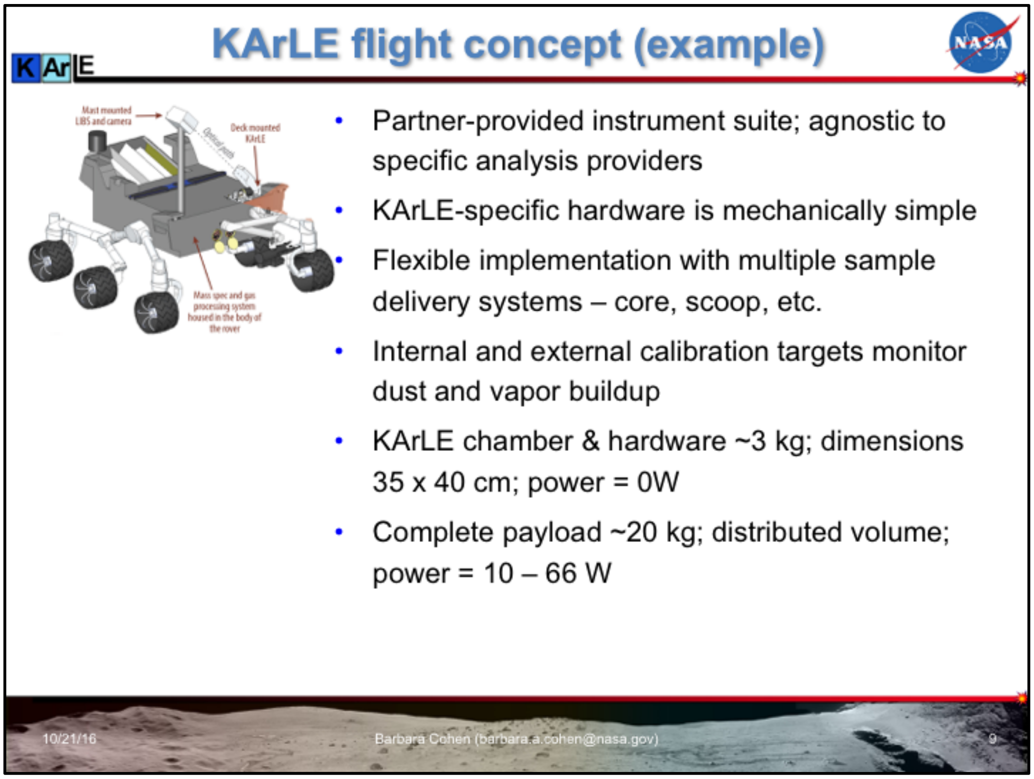

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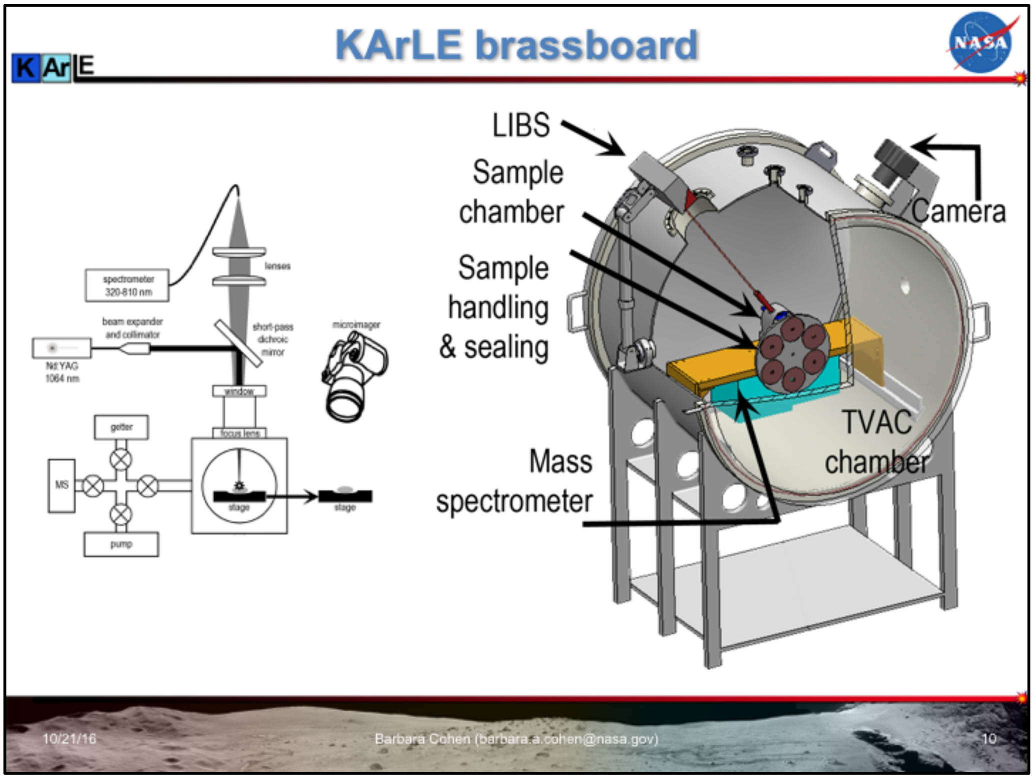

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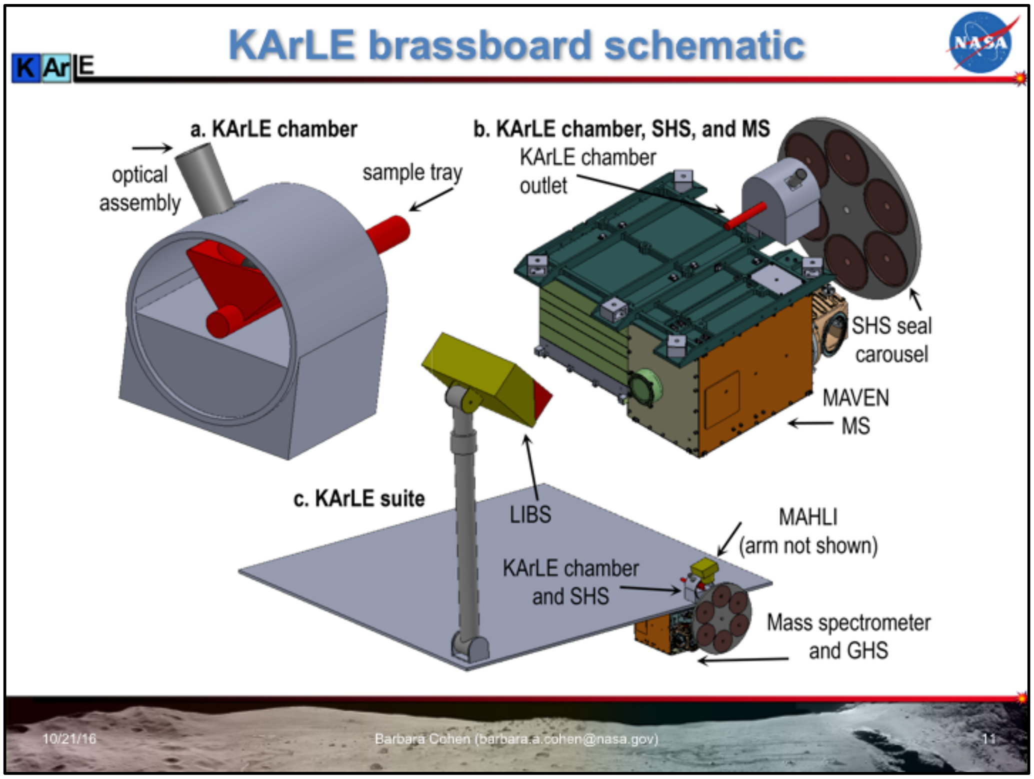

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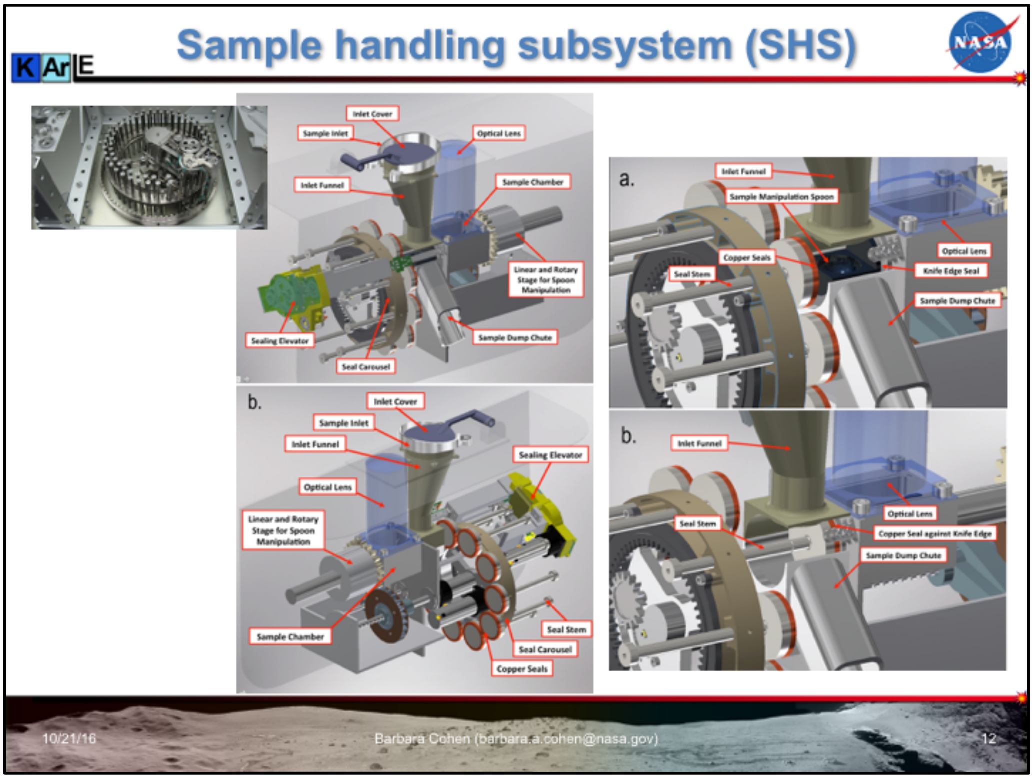

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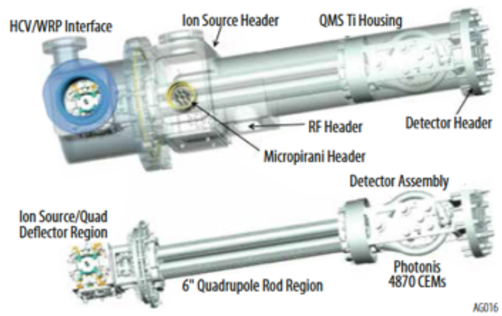
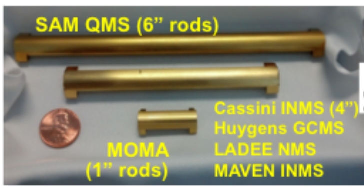
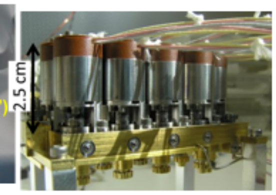
KArLE

Gas handling subsystem (GHS)







KArLE QMS sensor assembly comprising the three main hardware elements (ion source, rod assembly, and detector) within a custom Ti housing with multi-pin headers. Total length ~ 30 cm.

The KArLE QMS leverages the flight design of (left) the Sample Analysis at Mars microvalves; and (right) the hyperbolic rods for SAM, Cassini-Huygens, MSL, LADEE, MAVEN, and ExoMars.

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Summary

- *In situ* dating does not replace sample return - however, we can't get samples from everywhere in the solar system
- KArLE can determine the age of geologic samples with 10-15% precision, sufficient to address a wide range of fundamental questions in planetary science
- We achieve this using flight-proven components with no consumables or inherently limiting steps, enabling thousands of measurements
- KArLE-specific hardware is a simple, low-cost, value-added addition to a synergistic payload that achieves analyses common to most planetary surface missions (elemental and volatile analysis, microimaging)
- Flight heritage of components ensures they will fit (mass, volume, power) on future landers or rovers to the Moon, Mars, Asteroids (Phobos, Vesta, Ganymede ….)