Visualizing Organic Textures and Biosignatures: Analysis of the Deep Biosphere, Meteorites, and Mars. R. Bhartia[1], V. Orphan[2], G. Wanger[1,3], L. Beegle[1], M. Fries[4], J. Amend[3]. [1]Jet Propulsion Laboratory, Planetary Science, Pasadena, CA. (rbhartia@jpl.nasa.gov) [2]Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, [3]Dept of Earth Sciences, University of Southern California, Los Angeles, CA, [4]NASA Johnson Space Center, Houston, TX.

Introduction: Understanding life in the subsurface offers a unique understanding of how we can search for potential biosignatures on Mars. The spatial distribution of communities in this nutrient limited environment can be co-located with mineral facies, associated to morphological features, or bound to zones of high potential energy[1]. Comparing these organic textures to abotically driven processes in meteorites, when coupled to characterization of the organic content, spatial relationships to mineralogical and elemental textures, and morphology will aid in our understanding of the likely provenance of organics on Mars.

Often we approach biosignatures detection with an earth-centric perspective where we assume that extant or ancient life leaves behind visible indicators; either as pigments used to absorb energy from the sun/radiation, protectant from UV radiation, or as verigated mineral facies that may persist in the rock record. Our analysis of subsurface life, a region that is decoupled from the photozone (decoupled from photosynthesis) and/or exists in a nutrient limited environment, has shown that we need to capitalize on a wider range of the electromagnetic spectrum over multiple spatial scales to understand where microbial life may exist, how they make a living, and how/if their signatures will persist geological time.

Similar to the approach of the NAI Life Underground program, the Mars 2020 project includes a suite of instruments operating over the meter to micrometer scale that will observe the surface (and near subsurface) of Mars from gamma rays to the IR – a range where minerals and organics reflect, absorb, and vibrate. More specifically, the combined capabilities of both SHERLOC (a deep UV Raman/fluorescence spectrometer)[2] and PIXL (an X-ray fluorescence spectrometer), spatial maps of organics minerals and elements will be correlated to morphology and textures to assess potential biosignatures.

We present here our results of a spectral pipeline developed under the NAI Life Underground program which integrates organic, mineral, and elemental analyses over multiple scales on samples from the deep biosphere and meteorites. We will use these to describe a method to assess patterns that could result from meteoritic in-fall, abiotic processes, or potential biosignatures on the surface of Mars.

References: [1] Bhartia R. et al. (2010) *AEM,* 76(21)7231. [2] Beegle, L. W. et al. (2015) *IEEE, 90,* 1-11.