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Introduction: The clouds of Venus are *terra incognita*, in spite of *in situ* measurements by probes and balloons in the 1970s and 1980s. The primary absorber of sunlight in the clouds is unknown. The chemistry of trace species and elemental sulfur with Venus' aerosols is completely unmeasured. Interpretations of the Pioneer Venus nephelometer data and more recent high phase angle albedo measurements both suggest that some Venus aerosols may be more than liquid sulfuric acid/water droplets.

Investigations: For these reasons, a planetary payload to do in situ investigations of the clouds of Venus should characterize the size distribution, composition, and chemistry of Venus cloud aerosols. The chemical cycles of sulfur are of primary importance to understanding what is happening in the clouds. Microscopy and Raman spectroscopy can characterize morphology and detect organic compounds. More sophisticated methods would be necessary for determining whether any organic compounds are biotic [1]

Life in Venus' Clouds?: The available data on Venus' clouds do not preclude extant life. Indeed, several species of terrestrial Archea species would be at home in Venus' highly acidic cloud aerosols [2]. The absorption and scattering of light within the clouds is poorly enough characterized to admit the possibility of a microbial community living within Venus' clouds. The chemistry and microphysics of trace species in Venus' cloud aerosol is so poorly constrained that microbial metabolism could be operating within the aerosols, heretofore undetected.

This is one reason why Venus is a target of astrobiological significance. Present data and known physical conditions do not preclude life; therefore, the clouds of Venus may be a habitable environment. We are therefore compelled to explore this potential extraterrestrial habitat (Venus' cloud aerosols) as an important scientific priority. As with Mars, the approach should be to characterize the environment with increasingly sophisticated experiments, learning valuable science on the way, while also looking out for life. Furthermore, Venus is close, *in situ* experiments in Venus' clouds are entirely technologically possible, and the results from a properly designed life experiment would be almost definitive, a rarity in planetary exploration.

Comparative Planetology: Venus aerosols have much in common with particles from large Earth volcanic eruptions, so understanding their size, distribution, constituents, and their role in heterogeneous chemistry provides valuable perspective for Earth atmospheric studies.

References: [1] Vago, J. L. et al. (2018) *Astrobiology, 17,* 471–510. [2] Limaye, S. S. et al. (2018) *Astrobiology.*