

Abstract: This talk describes a new project which has recently been funded by the NASA Astrobiology Institute. The goal of this new research is to learn how to recognize the presence of life on extrasolar planets by identifying the signatures of life in their spectra. To achieve this goal, we will develop a suite of innovative modeling tools to simulate the environments and spectra of extrasolar planets. The modeling tools will constitute a Virtual Planetary Laboratory, which will be used to explore the plausible range of atmospheric compositions and globally-averaged spectra for early Earth, other planets in our solar system, and for extrasolar planets both with and without life. The results of this research will provide an improved understanding of the range of atmospheric compositions that are possible for planets with and without life, and will help to quantify the effect of life on the atmospheric spectrum and composition of a planet. The models will also provide a comprehensive spectral catalog, a "menu" of biosignatures, which will be used to determine the optimum wavelength range, spectral resolution, and sensitivity required to remotely sense the signs of life in the atmosphere or on the surface of another world.