Astrochemistry from the First Stars to the Origins of Organic Chemistry

Daniel Savin

Columbia University, NY, USA

Abstract
Interstellar chemistry plays an important role in the evolution of the Universe from the formation of the first stars to the origins of life. I will discuss three important links in this chain of chemical reactions. The first is the formation of H2 in the early Universe. Uncertainties in this process limit our ability to reliably model the formation of the first stars. The other two links we study involve the start of the cosmic pathway toward life. This begins in interstellar clouds where gas-phase reactions of C with H3+ help to fix the carbon into molecules, thereby initiating the synthesis of complex organic molecules, and gas-phase reactions of O with H3+ lead to the formation of water. Uncertainties in both of these reactions have hindered our understanding of this pathway toward life. I will briefly review the uncertainty analyses which motivated our studies, describe our experimental work, and touch on how the improved accuracy of the chemical data have reduced the uncertainty in our understanding of these two important epochs in the history of the cosmos.

Biography
Daniel Wolf Savin received his PhD in Physics from Harvard University, working at the Harvard-Smithsonian Center for Astrophysics. He was a postdoctoral research physicist in the Space Sciences Laboratory at the University of California at Berkeley. From there he moved to the Astrophysics Laboratory at Columbia University, where he is now a senior research scientist. His research career began in the area of atomic laboratory astrophysics but has since expanded to include molecular laboratory astrophysics and solar physics. Dr. Savin was a driving force behind the recent creation of the Laboratory Astrophysics Division (LAD) of the American Astronomical Society and currently serves as the LAD Secretary. He has authored or co-authored over 150 publications and is a Fellow of the American Physical Society.