The origin and adaptability of life on Earth holds a fascination for most of us and is a central and compelling field of study for many scientists. Chemists have been involved in this field in many ways, include discovering how simple biomolecules, as building blocks for life, can be generated under prebiotic conditions, and how biomolecular processes can be adapted to extreme environmental conditions. More broadly, a study of extremophile biochemistry should, in principle, provide guidelines for the formation and evolution of life elsewhere, assuming that evolution is a general principle underlying the development of living systems on other planets besides the Earth. In this symposium, we will combine members of the Astrochemistry community with those chemists working on the properties of extremophiles to provide a broad picture of the latest results and insights into how, under extreme conditions, simple molecules become more complex and complex biomolecules (proteins, nucleic acids, etc.) adapt to inhospitable environments to enable and extend life in surprising habitats. Topics include interstellar chemistry, prebiotic terrestrial chemistry, and the properties and structures of extremophile proteins from extreme thermal, chemical and other challenging environments. The utilization of these studies to biotech applications will also be presented.