

# Generalized Stoichiometry and Biogeochemistry for Astrobiological Applications



**Intro:** Elemental ratios in living things on Earth are related to environmental elemental abundances, ecological dynamics, and cell **size and** physiology. Generalized physiological models can be used to predict what elemental ratios may be found in extraterrestrial biological systems.

**Experiments & Results:** Models of elemental ratios within biological systems can be derived from cellular size and **macromolecular** abundances. These models can be combined with **environmental abundances within** ecological models of biogeochemistry **to predict the abundances in cells and the environment.**

**Significance:** By making *in situ* measurements of particle size, particle stoichiometry, and fluid/environmental stoichiometry, evidence for biological activity can be detected both at the cell and ecosystem level. This has implications for future astrobiological missions, as this biosignature is agnostic to life as we know it.

C.P. Kempes, M.J. Follows, H. Smith, H. Graham, C.H. House, S.A. Levin. *Bulletin of Mathematical Biology* (2021) 83:73.

