

Ecosystem Nexus: from *E.coli* to Ocean Bacterioplankton Collective Patterns

Matteo Convertino, PhD
 Associate Professor
 Nexus Group, Hokkaido University

The talk will address models (theoretical and computational) and findings about biological and biota-environmental networks from single to multiple bacterial species populations in human and natural ecosystems. The fundamental role of the environment (captured in the space-time continuum as hydro-driven flow) is highlighted in determining functional species network topology and phase transitions associated to healthy and dysbiotic states. Patterns of collective organization and early-warning indicators are proposed to assess the optimality of ecosystems and their divergence. The quest is for a general metabolic theory of basin ecosystem functioning as information processing, leading to understanding complex environmental dynamics underpinning biota organization, bio-inspired technology and multiscale biosystems engineering to control population patterns as ecosystem services. Examples of ongoing microbiome engineering projects connecting science and technology are provided.

