Simposio Internacional: Evolución por cooperación. La obra de Lynn Margulis (1938-2011)
***International Symposium**: Evolution by cooperation. The work of Lynn Margulis (1938-2011)*

Madrid, 12 y 13 de noviembre de 2012
Madrid, November 12-13, 2012

Symbiotic planet: from the Cosmos to the microcosmos

Ricardo Guerrero
Department of Microbiology, University of Barcelona.
Institut d'Estudis Catalans, Barcelona

Throughout evolution, microorganisms have been responsible for the maintainance of the biosphere. However, only rarely the microorganisms responsible for key processes have been identified, despite the crucial role that they play in the cycling of nutrients, Obstacles that have traditionally hampered fundamental microbial ecology inquiries are now yielding technical advancements. All current information about prokaryotes is based on measurements done on less than 5000 isolated species, which represent ca. 0.1 % of the total estimated diversity of prokaryotes in the biosphere. The Earth's habitats have complex gradients of environmental conditions that include extreme variations in temperature, light, pH, pressure, salinity and both inorganic and organic compounds. Each geochemical setting features its own panoply of resources that can be physiologically exploited by microorganisms. Although very small (10^{-7} to 10^{-6} m), they are abundant (10^{30} to 10^{32} individuals globally, including viruses). Their phylogenetic and physiological diversity is considerably higher than that of animals and plants, and their interactions with other life forms are correspondingly more complex. Microbes interact with the other forms of life (their descendants) in many ways, from planetary to cellular scale. On a planetary scale, microbes regulate essential processes in both continents and oceans. Over geological time the ocean has evolved from being an anaerobic incubator of early cellular life into a solar-powered emitter of molecular oxygen, a transformation that has been punctuated by catastrophic extinctions followed by the iterative re-emergence of biological diversity. Today, the ocean is becoming substantially warmer, more acidic and with a clear expansion of oxygen-starved regions. Theses changes have altered the cycling of trace gases such as methane, nitrous oxide and carbon dioxide, which are very significant for the global metabolism and can affect the climate change. On a cellular scale, microbes live on and inside (both peri- and intra-cellularly) all other organisms, affecting their metabolisms and fitness. Not any single species can evolve without the concomitant evolution of its accompanying microbes. Evolution is an integrative process in which organisms, populations and whole ecosystems adaptatively change following environmental modifications according to the constrictions of natural selection.