Modularity and division of labor: from theory to experimental evolution

María Rebolleda Gómez*[1]

[1]University of Minnesota - Twin Cities (U of M) – United States

Abstract

Division of labor requires high levels of cooperation. Extreme cases, like erythrocytes, have given up any possibility of passing genetic information, but their function is essential for the survival of the organism as a whole. From an evolutionary perspective this degree of cooperation posses two problems: first, how could some cells have evolved to sacrifice their reproductive success for the benefit of the organism? Second, cellular differentiation requires the evolution of a complex regulatory pattern, in which all cell types have to develop in a precise way from a single (or a few) totipotent cell(s). The question is then, how could such a complex pattern of expression evolve in the first place? The aim of this work is twofold. First, I argue that modularity is a useful concept to understand the evolution of division of labor. Second, I use this framework to explore the evolution of cellular differentiation using a simple and tractable experimental system. Multicellular individuals that develop via mother-daughter adhesion evolved from a unicellular ancestor (a *Saccharomyces cerevisiae* strain) in the laboratory as a result of a selection experiment. Using this recently evolved multicellular organisms as a system; this work explores the experimental conditions favoring the evolution of cellular differentiation.

*Speaker