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Sommario/riassunto

The most evident aspect of biodiversity is the variety of complex forms and behaviors among organisms, both living and extinct. Comparative molecular and physiological studies show that the evolution of complex phenotypic traits involves multiple levels of biological organization (i.e. genes, chromosomes, organelles, cells, individual organisms, species, etc.). Regardless of the specific molecular mechanisms and details, the evolution of different complex biological organizations share a commonality: cooperation and conflict among the parts of the biological unit under study. The potential for conflict among parts is abundant. How then do complex systems persist, given the necessity of cooperative behavior for their maintenance, when the potential for conflict occurs across all levels of biological organization? In this Research Topic and eBook we present ideas and work on the question, how coexistence of biological components at different levels of organization persists in the face of antagonistic, conflicting or even exploitative behavior of the parts? The goal of this topic is in presenting examples of cooperation and conflict at different levels of biological organization to discuss the consequences that this "tension" have had in the diversification and emergence of novel phenotypic traits. Exemplary cases are studies investigating: the evolution of genomes, formation of colonial aggregates of cells, biofilms, the origin and maintenance of multicellular organisms, and the stable coexistence of multispecies consortia producing a cooperative product. Altogether,

we hope that the contributions to this Research Topic build towards mechanistic knowledge of the biological phenomenon of coexistence in the face of conflict. We believe that knowledge on the mechanisms of the origin and evolutionary maintenance of cooperation has implications beyond evolutionary biology such as novel approaches in controlling microbial infections in medicine and the modes by studies in synthetic biology are conducted when designing economically important microbial consortia.The most evident aspect of biodiversity is the variety of complex forms and behaviors among organisms, both living and extinct. Comparative molecular and physiological studies show that the evolution of complex phenotypic traits involves multiple levels of biological organization (i.e. genes, chromosomes, organelles, cells, individual organisms, species, etc.). Regardless of the specific molecular mechanisms and details, the evolution of different complex biological organizations share a commonality: cooperation and conflict among the parts of the biological unit under study. The potential for conflict among parts is abundant. How then do complex systems persist, given the necessity of cooperative behavior for their maintenance, when the potential for conflict occurs across all levels of biological organization? In this Research Topic and eBook we present ideas and work on the question, how coexistence of biological components at different levels of organization persists in the face of antagonistic, conflicting or even exploitative behavior of the parts? The goal of this topic is in presenting examples of cooperation and conflict at different levels of biological organization to discuss the consequences that this "tension" have had in the diversification and emergence of novel phenotypic traits. Exemplary cases are studies investigating: the evolution of genomes, formation of colonial aggregates of cells, biofilms, the origin and maintenance of multicellular organisms, and the stable coexistence of multispecies consortia producing a cooperative product. Altogether, we hope that the contributions to this Research Topic build towards mechanistic knowledge of the biological phenomenon of coexistence in the face of conflict. We believe that knowledge on the mechanisms of the origin and evolutionary maintenance of cooperation has implications beyond evolutionary biology such as novel approaches in controlling microbial infections in medicine and the modes by studies in synthetic biology are conducted when designing economically important microbial consortia.