Center for Theoretical Biological Physics

SEMINAR

"The Survival of the Most Cooperative: Insights from Biological and Mathematical Systems"

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12:30 - 1:30 PM
BRC, 10th Floor, Rm 1060 A/B

Cooperation, the act of providing a benefit to others at a cost to oneself, is widespread and has been thought to drive the major transitions in evolution. However, cooperation is vulnerable to "cheaters" who gain an advantage over cooperators by consuming benefits without paying a cost. How have extant cooperative systems survived cheaters? We have engineered a cooperating-cheating yeast system. In this system, cooperators and their heterotypic cooperative partners (partners) exchange distinct essential metabolites. Cheaters exploit partner-produced metabolites without reciprocating, and are competitively superior to cooperators. Because this system is engineered, it lacks biotic mechanisms known to protect cooperators from cheaters. Using this experimental system and mathematical models, we have delineated two mechanisms that stabilize cooperation against cheating: environmental stresses and spatial self-organization. These mechanisms can presumably "buy" cooperators time to eventually evolve sophisticated cheater-recognition mechanisms.