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アドバンス生命理学特論・GTRセミナー
Topics in Advanced Biological Science・GTR seminar

Of fish and flies: studying the biological basis of sociality in two model organisms

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Social interactions play a major role in different functional domains relevant for Darwinian fitness, such as finding food, choosing mates, or avoiding predators. Therefore, at the proximate level social interactions are a key mortality risk factor with health implications and at the ultimate level, sociality impacts ecological and evolutionary processes. Our lab studies social behavior at both levels, combining the study of proximate causes (genes, hormones, neural circuits, cognitive processes) and ultimate effects (evolutionary consequences). For this purpose, we have been using two model organisms in the lab - zebrafish and fruit flies - to study the neural circuits and the genetic architecture of social behavior. In this talk, I will provide some examples of the work done in our lab in both model organisms. First, I will show how oxytocin plays a critical role in the development of sociality in zebrafish and how it interacts with the developmental environment to shape the emergence of different aspects of adult social behavior. I will then, show how oxytocin is necessary and sufficient for complex social behavior in adult zebrafish, including social contagion of fear and emotion recognition. Finally, I will address the evolvability of sociality in zebrafish illustrated by an artificial selection experiment (currently in the F7). In the second part of my talk, I will present results on a study that investigates the genetic architecture of social cognition in Drosophila. We specifically address the question of social learning being a domain-specific or a general-domain cognitive process. For this purpose, we have phenotyped social and asocial learning in the core lines of the DGRP panel. We show that there is no phenotypic correlation between the two learning types and that the GWAS revealed different genetic variants located in different genes associated with social and asocial learning. Finally, we show that most social learning-associated genes are expressed in the Drosophila mushroom bodies and functionally confirmed their involvement in learning using RNAi lines. Together these results highlight the potential of each model organism to address question related to the mechanisms underlying sociality.

Date: March 22, 2024 (Fri) 14:00～15:30

Place: E131

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