23
JAN.
2014

de 11h à 12h

SÉMINAIRE

# Evolution of evolvability under fluctuating selection

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Empirical evidence suggests that fluctuating selection is a major evolutionary mechanism. The most straightforward consequence of rapid changes of the fitness function is the induced response of the mean phenotype in the population. Yet, repeated back-and-forth evolutionary trajectories are also suspected to affect the genetic architecture underlying the phenotypic characters subject to continuous adaptation. In order to better understand the long-term consequences of fluctuating selection, we modeled the response of complex, multilocus genetic architectures to various natural selection regimes -- stabilizing, directional, and fluctuating. This model accounts for gene-gene interactions (through multilinear epistasis), and thus allows to investigate the dynamics of evolutionary potential at two distinct levels: (i) the standing genetic variation, i.e. the capacity for the population to respond immediately to directional selection, and (ii) the level of canalization (measured as the average effect of new mutations),which reflects the capacity for the population to replenish genetic variation. Both analytical results and individual-based simulations show that fast fluctuations (white noise change in the phenotypic optimum every generation) are essentially similar to stabilizing selection, promoting a degree of genetic canalization and low evolvability. In contrast, when large fluctuations of the phenotypic optimum (beyond the phenotypic range of the population) occur every 10 to 100 generations, equilibrium mutational effects and genetic variance are higher and the population is more evolvable. However, there was no evidence that decanalization and increased evolvability were adaptive, and fluctuating selection remains intrinsically more constraining than genetic drift.