

biofundamentals : biological foundations

To bring a recognition of the uninterrupted continuity of life at the cellular and molecular levels, from the origin of life to all current organisms. Students are encouraged to consider this basic biological fact in their descriptions and models of biological behaviors, traits, and scenarios.

To be able to apply appropriate evolutionary mechanisms (mutation and genome dynamics, selection at both the individual and social levels, sexual selection, and stochastic, non-adaptive mechanisms, such as genetic drift and gene linkage) to generate plausible analyses of particular behaviors and traits. In particular we use social evolutionary concepts to consider (and interpret) the behavior of multicellular organisms.

To generate plausible molecular level scenarios to better understand cellular behaviors, including DNA regulation and repair, gene expression, polypeptide synthesis and protein assembly and turnover.

- This requires that students develop and be able to accurately apply an understanding of the factors involved in molecular interactions (affinities, on-off rates, concentrations), knowledge upon which our analysis of membrane structure and properties is based, as well developing a working understanding of the features of the molecules and macromolecules from which molecular machines are built, and how such machines act to carry out specific functions.
- Students need to develop the ability to use their biological knowledge to apply or (if necessary develop) plausible models for biological behaviors, such as quorum sensing, programmed cell death, and other social behaviors, the stochastic features of gene expression (transcriptional and translational bursting) and differentiation (e.g. in *Dictyostelium*).

