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"Costs, benefits and constraints in the evolution of learning: lessons from butterflies (and a few mammals)”

Learning and cognition allow organisms to cope with novel and varying environments.  And yet, despite these benefits, learning varies widely across populations and species.  This talk details several studies on how understanding costs, constraints and benefits of learning may allow us to understand variation in neural investment.  First, it has been hypothesized that variation in learning is associated with costly neural investment which results in changes in life history such as delayed reproduction.  In support of this idea, genetic variation in learning in butterflies is correlated with variation in brain size and reproductive timing and manipulation of reproductive timing results in changes in learning ability.  Second, it has also been suggested that nutrition may act as a constraint on the evolution of costly neural tissue.  Studies within and across butterflies provide support for this hypothesis, in particular with respect to availability of protein and sodium.  Finally, cognition is thought to be beneficial in novel environments, and yet it is unclear to what extent cognitive abilities are evolving in human-altered environments. Preliminary data analyses suggest that relative cranial capacity is greater in urban populations of Minnesota mammals, especially those with high fecundity. These results have implications for understanding the evolution of learning in a range of systems, including humans."