CO-EVOLUTION OF *ESCHERICHIA COLI* AND ITS PARASITE *BDELLOVIBRIO BACTERIOVORUS*: AN EXPERIMENTAL MODEL FOR EUKARYOGENESIS. M. A. Kinnersley[1] and R. F. Rosenzweig[1], [1]University of Montana, 32 Campus Drive HS104, Missoula MT 59812.

Introduction: The history of Life on Earth has been punctuated by major transitions in cellular form and function that have driven significant increases in cellular complexity. Among these transitions, perhaps the most crucial to understanding extant biodiversity is the transition from prokaryote to eukaryote (eukaryogenesis). Because the timing of eukaryogenesis coincides with the phylogenetic origin of the mitochondrion, it has been hypothesized that acquisition of this organelle heralded the prokaryote-eukaryote transition. While our understanding of mitochondriogenesis is complicated by the fact that it only happened once, key aspects of this evolutionary transition can be addressed using the power of experimental evolution.

Experimental Design: The use of a simple, straightforward model for the advent of mitochondria using *Escherichia coli* and the intracellular prokaryotic predator, *Bdellovibrio bacteriovorus*, is currently being investigated. Guided by the "parasitism" hypothesis of mitochondrial origin and the theoretical literature showing how mutualism can evolve from parasitism, increasingly endosymbiotic *Bdellovibrio* are selected by favoring *Bdellovibrio* that can co-exist for extended periods of time with their host without harming it. Several experimental approaches including predator mutagenesis/screening, host auxotrophy complementation and fluorescent sorting of marked host-parasite pairs are being employed.

Significance: This co-evolving system will be used to test hypotheses concerning ecological prerequisites for, early molecular events in, and evolutionary consequences of incipient endosymbiosis based on metabolic niche partitioning and energy generation, exactly the features that define the mitochondrion's role in eukaryotic systems. tagging of Understanding these aspects of mitochondriogenesis is essential for truly understanding the prokaryotic/eukaryotic transition and thus is applicable to the study of myriad aspects of cellular and organismal diversity.