

A unified model of recombination in life

Initiative: "Leben?" - Ein neuer Blick der Naturwissenschaften auf die grundlegenden Prinzipien des Lebens
(beendet)

Bewilligung: 26.03.2017

Laufzeit: 5 Jahre

All of life must undergo recombination to avoid extinction by Muller's ratchet, i.e., the accumulation of deleterious alleles during clonal growth. Yet the ways in which DNA substrates meet for recombination in prokaryotes (transduction, conjugation and transformation) versus eukaryotic cells (syngamy and karyogamy) share no homology. The sum consequence of those differences is sex. The purpose of the proposed project is to deliver a unified model for recombination in life. This requires three advances: (1) a computational model for the processes in nature that underlie the distribution of genes across prokaryotic genomes; (2) an understanding of the origin of sex that incorporates crucial new findings from evolutionary microbiology: the host that acquired the mitochondrion was an archaeon (no classical theory for the origin of sex takes that into account); and (3) integration of the origin of vertical eukaryotic inheritance before the backdrop of lateral recombination among prokaryotes. Only by integrating gene transfer, population genetics, and endosymbiosis into a unified recombination framework, computational models able to predict the fundamental differences in gene distribution that are observed across the prokaryote-eukaryote divide can be obtained.

Projektbeteiligte

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