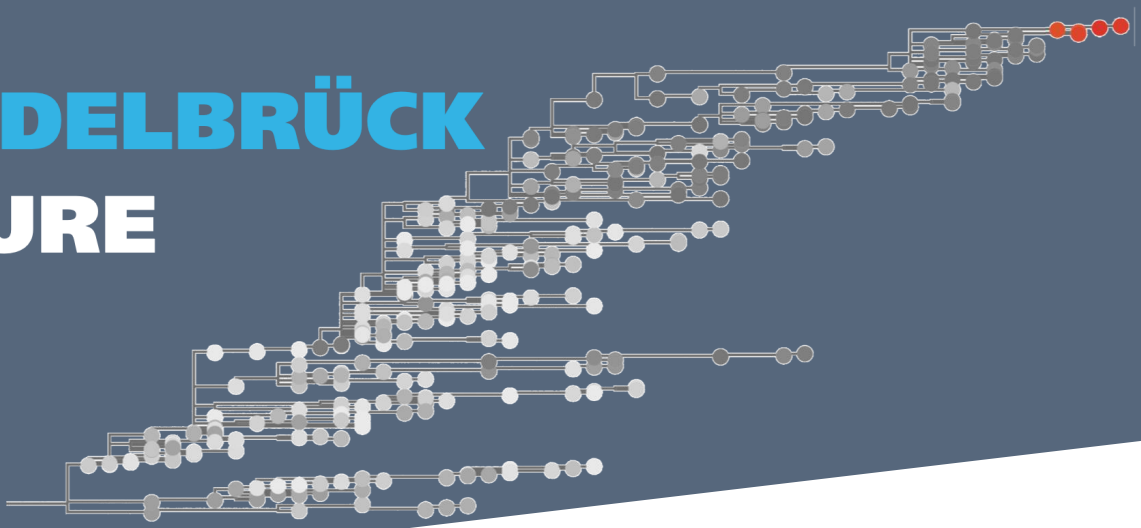


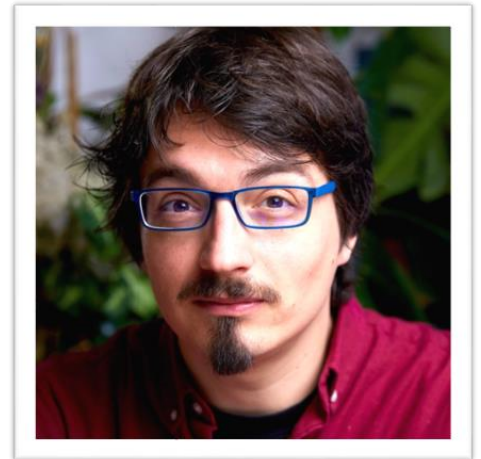
MAX DELBRÜCK LECTURE



The evolution of fitness effects during long-term adaptation in bacteria.

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The distribution of fitness effects of new mutations (DFE) is central to predicting many aspects of adaptive evolution. While short-term experiments offer a snapshot of this distribution, tracking how it changes as organisms adapt has only recently become possible. We took advantage of the possibility of creating and characterizing libraries with >100,000 independent mutations in bacteria to examine how the DFE changed in the multi-decade, *E. coli* Long-term Evolution Experiment (LTEE). We found that the overall structure of the DFE has hardly changed even after 50,000 generations, and that nonessential genes frequently became essential and vice versa, often in parallel. In contrast, the beneficial fraction declined rapidly, approximating an exponential distribution, with strong epistasis profoundly changing the genetic identity of adaptive mutations. Despite this volatility, many important targets of selection were predictable from the ancestral distribution. This predictability occurs because genetic target size contributed to the fixation of beneficial mutations as much as or more than their effect sizes. Taken together, our results demonstrate the dynamic - but often statistically predictable - nature of mutational fitness effects.

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University of Cologne

Institute for Biological Physics

Seminar Room S0.02, Zülpicher Str. 77a

Hosted by G. Petrunaro & M. Lässig