

Abstract Submitted
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Fitness and structure landscapes for pre-miRNA processing RALF

BUNDSCHUH, Departments of Physics and Biochemistry, The Ohio State University, JULIETTE DE MEAUX, Fachbereich Biologie, Universitaet Muenster, MICHAEL LASSIG, Institut fuer theoretische Physics, Universitaet zu Koeln — The processing from pre-miRNA to mature miRNA in plants involves a mechanism, which depends on an extended stem in the secondary structure of the pre-miRNA. Here, we show how natural selection acts on this secondary structure to produce evolutionary conservation of the processing mechanism together with modularity of the pre-miRNA molecules, making this molecular function independent of others. Our main results are: 1. Selection on miRNA processing can be described by a fitness landscape which depends directly on the secondary structure of the pre-miRNA. 2. This fitness landscape predicts the divergence of the phenotype between orthologous pre-miRNA molecules from different species. 3. Actual pre-miRNA structures are modular: their phenotype is significantly less affected by deleterious mutations in the remainder of the molecule than for random RNA molecules.

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