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Luria-Delbrck Revisited: The Classic Experiment Doesnt Rule out Lamarckian Evolution[1] CAROLINE HOLMES, MAHAN GHAFARI, ANZAR ABBAS, VARUN SARAVANAN, ILYA NEMENMAN, Emory University — We re-examine data from the classic 1943 Luria-Delbruck fluctuation experiment. This experiment is often credited with establishing that phage resistance in bacteria is acquired through a Darwinian mechanism (natural selection on standing variation) rather than through a Lamarckian mechanism (environmentally induced mutations). We argue that, for the Lamarckian model of evolution to be ruled out by the experiment, the experiment must favor pure Darwinian evolution over both the Lamarckian model and a model that allows both Darwinian and Lamarckian mechanisms. Analysis of the combined model was not performed in the 1943 paper, and nor was analysis of the possibility of neither model fitting the experiment. Using Bayesian model selection, we find that: 1) all datasets from the paper favor Darwinian over purely Lamarckian evolution, 2) some of the datasets are unable to distinguish between the purely Darwinian and the combined models, and 3) the other datasets cannot be explained by any of the models considered. In summary, the classic experiment cannot rule out Lamarckian contributions to the evolutionary dynamics.

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