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**Stochastic Loss of an Occasionally-Essential Function** ELIZABETH JERISON, MICHAEL DESAI, Harvard University — Many biological functions are useful only in specific circumstances. For example, hundreds of single-gene deletions in yeast increase growth rate in some laboratory conditions. During periods of disuse, these genes are vulnerable to disruption or loss via random mutation and genetic drift. Yet they are maintained in natural populations, suggesting that they must be useful at least occasionally. Here we quantify the risk of loss of such occasionally-important functions. We focus on predicting how the statistics of environmental change determine the mean time to loss of the function. Our results suggest a refinement to the Savageau 'use-it-or-lose-it' principle of regulation, and put theoretical lower bounds on how often these functions must be necessary to the organism, in order to be maintained.

Elizabeth Jerison
Harvard University

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