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On the Mass Distribution of Animal Species¹ SIDNEY REDNER, Boston University, AARON CLAUSET, Sante Fe Institute, DAVID SCHWAB, UCLA — We develop a simple diffusion-reaction model to account for the broad and asymmetric distribution of adult body masses for species within related taxonomic groups. The model assumes three basic evolutionary features that control body mass: (i) a fixed lower limit that is set by metabolic constraints, (ii) a species extinction risk that is a weakly increasing function of body mass, and (iii) cladogenetic diffusion, in which daughter species have a slight tendency toward larger mass. The steady-state solution for the distribution of species masses in this model can be expressed in terms of the Airy function. This solution gives mass distributions that are in good agreement with data on 4002 terrestrial mammal species from the late Quaternary and 8617 extant bird species.

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