



FIGURE 15.12. (A) Inbreeding is inevitable even in a large population. Going back in time, there are potentially 2, 4, 8, 16, ... ancestors in the pedigree. Eventually, some individuals must contribute several times. In this example, the 2 individuals marked with a *red asterisk* each contribute twice to the pedigree, whereas the other 12 ancestors each contribute once. Thus, there are 14 ancestral individuals instead of 16. (B) The dots show the distribution of contributions of the ancestors of the English King Edward III (1312–1377), traced back for about ten generations. Some ancestors contribute once, but others up to six times. The lines show simulations assuming that mating is random, within a closed population of 2048 (*upper curve*) or 4096 (*lower curve*), representing the English nobility. (C) Tracing back further in time, ancestors may make contributions down many lines of descent. The curves show the distribution of numbers of contributions in a simulated population of $2^{15} = 32,768$ individuals, traced back 9, 11, 13, ..., 23 generations (*left to right*). Twenty-three generations back, ancestors typically make up to several hundred contributions to the pedigree, but rarely more than 1000 (see peak in *rightmost curve*).

15.12B,C, redrawn, with permission, from Derrida B. et al., *Phys. Rev. Lett.* **82**: 1987–1990, © 1999 American Physical Society, <http://www.aps.org>

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