1024-05-36 **Joshua N Cooper*** (cooper@math.sc.edu), 1523 Greene St., LeConte College, USC, Columbia, SC 29208, and **Lincoln Lu** (lu@math.sc.edu), 1523 Greene St., LeConte College, USC, Columbia, SC 29208. *Where power laws come from: A model-free etiology.*

We offer a much sought-after answer to the question, "Where do power laws come from?" which makes no reference to any particular model. Many random graph models have been studied in the past few years that give plausible growth processes for real-world massive graphs, and which provably yield power law degree sequences with high probability. However, there are so many different real-world processes that produce power law degree distributions that it is hard to see how even a large collection of parametric models could account for all observed behaviors. Furthermore, many of the proposed models are not robust, in the sense that small perturbations of their growth rules destroy the power law.

We offer an alternative explanation that is inherently model-free. In particular, we give a natural, rigorous definition of the oft-used term "scale-free" and show that it actually characterizes power law degree distributions. Since it is easy to see that massive graphs are generally scale-free in this sense, the resulting ubiquity of power laws is a consequence. We also find as a consequence a multitude of open questions ripe for study: scale-free hypergraphs and estimators for distributional exponents, for example. (Received December 08, 2006)