200-16. FOOD WEBS: RANDOM GRAPHS ARE USEFUL IN ECOLOGY!

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A food web describes which kinds of organisms eat which other kinds in an ecological community. Food webs are often reported as directed graphs, in which a vertex corresponds to a kind of organism, and a directed edge from vertex A to vertex B means that organism A is eaten by organism B. Webs with even few kinds of organisms may seem complex. Nevertheless, as an ensemble, food webs reported by scores of field ecologists over the last century are consistent with five simple quantitative empirical regularities. A new model based on random graphs, though simplified compared to reality, unifies and explains these empirical regularities quantitatively. In the model, the vertices are assigned an order, and directed edges are chosen randomly to be consistent with the given order. The model relates to percolation theory. The predicted asymptotic distribution of the length of the longest food chain is mathematically surprising. The published work on which this expository talk is based was done jointly with F. Briand and C.M. Newman [*Proc. Roy. Soc. London Ser. B* 224(1985):421-448, 449-461, *ibid.* 228(1986):317-353, 355-377]. [Received: 11 February 1987.]