

MacArthur R H & Pianka E R. On optimal use of a patchy environment.
Amer. Naturalist 100:603-9, 1966.
[Department of Biology, Princeton University, NJ]

A graphical model of animal feeding activities based on costs versus profits is developed. A forager's optimal diet can be specified and some interesting predictions emerge. Prey abundance influences the degree to which a consumer can afford to be selective because it affects search time per item eaten. Diets should be broad when prey are scarce (long search time), but narrow if food is abundant (short search time) because a consumer can afford to bypass inferior prey only when there is a reasonably high probability of encountering a superior item in the time it would have taken to capture and handle the previous one. Also, larger patches should be used in a more specialized way than smaller patches because travel time between patches (per item eaten) is lower. [The *SCI*® and *SSCI*® indicate that this paper has been cited in over 605 publications.]

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Ecology and economics involve numerous closely related and analogous phenomena: a particularly active area of cross-fertilization concerns the feeding activities of animals. Although it's difficult to believe now, foraging theory literally did not exist in 1965. When I arrived to do postdoctoral work with the late

Robert H. MacArthur immediately following his relocation from Pennsylvania to Princeton, I chanced upon an ideal situation for a young academic. This brilliant scientist was virtually without any colleagues, extremely approachable, and actually eager for interaction and intellectual stimulation! Immediately we began to discuss his newest ideas, then just a germ, on costs and benefits of various foraging activities. The speed with which MacArthur's mind worked, as well as its clarity, was simply dazzling. Never before had I encountered true genius. It was exhilarating but also humbling to be part of the two-man brainstorming effort that ensued during the fall and winter of 1965-1966. Each evening I went home determined to think of something really neat, but precious little came. Other than acting as a sounding board for MacArthur's mind, my major contribution to "optimal use" was to propose and outline the table summarizing its results! MacArthur's generosity in making me a coauthor was typical of his dealings with lesser scientists. Quite simply, I was exceedingly fortunate to be in the right place at the right time.

Our paper and J.M. Emlen's,¹ published back-to-back, ushered in the concept of optimal foraging, which has blossomed greatly.²⁻⁸ Behavioral ecologists have embraced foraging theory because it confers rigor and generates testable predictions in an otherwise fairly subjective field. Although optimality models have borne the brunt of savage attack, they remain one of the most powerful approaches to adaptation currently available. The theorem that diets contract when food is abundant and expand when food is scarce has proven to be exceedingly robust and now constitutes a basic tenet of evolutionary ecology.

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