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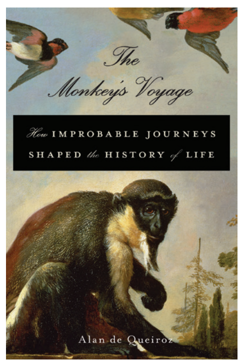
Pushing Your Luck

The Monkey's Voyage: How Improbable Journeys Shaped the History of Life. Alan de Queiroz. Basic Books, 2014. 304 pp., illus. $27.99 (ISBN 9780465020515 cloth).

Oceanic islands are remote bodies of ground that rise from the ocean floor; most occur far from any continent. Ranging from specks of rock to large masses, they can be isolated or in archipelagos. They are either active or extinct volcanoes related to volcanic activity on the ocean floor and, more specifically, to the movement of the lithospheric plates. Because of their inaccessibility and enduring isolation, oceanic islands might be expected to be bare and desolate. Although most are, in fact, deficient in whole classes of animals, several are inhabited by a surprisingly high number of species, and, for many of these animals, transoceanic dispersal would be very unlikely or even impossible.

The mystery of how and when organisms reached faraway islands has long intrigued natural scientists. In his book *The Monkey's Voyage: How Improbable Journeys Shaped the History of Life*, Alan de Queiroz gives his personal solution to how oceanic islands are colonized: natural rafting. The idea is that large masses of vegetation are dislodged by violent storms; carried down rivers; and, finally, buoyed out to sea, forming temporary islands on which animals can take refuge. These fortuitous vessels would then be carried by favorable currents to sail rapidly across stretches of saltwater. This so-called *sweepstakes route* of immigration is currently enjoying particular and growing popularity among biogeographers and paleontologists (Hafner et al. 2001, Measey et al. 2007, de Vos et al. 2007, Ali and Huber 2010, van der Geer et al. 2010). It was first described by the eminent paleontologist George Gaylord Simpson in a celebrated analysis delivered before the Washington Academy of Sciences on 15 February 1940 and published in the same year (Simpson 1940). In that influential address, Simpson introduced the term *sweepstakes route* for the sporadic, accidental, and highly selective dispersal from a continent to an island. (The term derives from the similar odds between the chances that organisms have to cross such barriers successfully and those of winning a sweepstakes.) Because of its intrinsically stochastic nature, sweepstakes dispersal is generally expected to produce insular faunas that are unpredictable, incomplete, oligotypical, and technically unbalanced, relative to mainland communities.



Using an informal, conversational language, with frequent and colorful slang, *The Monkey's Voyage* shows a curious crescendo from start to finish. The book comprises two parts. In the first, the author begins softly with two preambles—one on plate tectonics and, in particular, on the breakup of Gondwanaland, the other on cladists' views of the discontinuous distribution of organisms following the disruption of the supercontinent. Although the text is mostly controlled in this part, de Queiroz does not avoid pungent expressions against Léon Croizat and his cladistic or vicariant panbiogeographic theory. Another indispensable premise included in the first part of the book is de Queiroz's passionate endorsement of molecular dating and molecular biogeography and phylogeography, which is the true basis for his theories.

In the second part of the book, de Queiroz abandons all restraint. Relying on molecular dating (demonstrating that most of the biotas of oceanic islands originated after the breakup of supercontinental landmasses) and available geological information (incomplete for many islands) and, therefore, ruling out the physical connection of oceanic islands with mainland areas, de Queiroz attempts to solve all known biogeographic conundrums with overseas rafting. At the same time, he fiercely attacks Croizat, his followers, and all cladistic biogeographers, using expressions that fall outside the typical confines of scientific journal language.

Natural rafting might be a plausible solution to explain the arrival on islands of several plants, invertebrates, and small poikilotherm animals that have low metabolic rates, low food requirements, and low water flux rates, and, therefore, a greater ability to withstand oceanic distances. The literature informs us of 15 green iguanas that were swept from their Guadeloupe island home in the Caribbean by a hurricane in the fall of 1995 and were ferried 1 month on floating detritus before landing 200 kilometers away, on the beaches of Anguilla (Censky et al. 1998). Natural rafting certainly solves problems of distribution, but it raises many more questions than it answers, especially in the case of land mammals.

The author minimizes many problems arising from crossing an ocean: the detrimental effects of exposure to high concentrations of salt, the extreme changes in temperature and humidity, among others. Terrestrial mammals are disadvantaged with regard to their need for food and water supplies because of their high-energy requirements. The basic rules of human survival are as follows: 3 hours without shelter (in an extreme environment), 3 days without water, 3 weeks without food. An average human, with 40 liters of body water, who is lost at sea at a daily increased body salt concentration of 2–5 percent, depending on the surrounding temperature and humidity, would become comatose and die soon after 15–20 percent of his or her body water had been lost—in just a few days of beginning to drift. Mammals more thoroughly covered with hair may certainly respond differently, and the role of sweating in mammals varies greatly. We can even imagine animals traveling at metabolic levels lower than normal in a state of torpor or hibernation. However, not all mammals are capable of this or able to arise spontaneously from torpor when conditions change.

Experimental studies carried out from the 1940s until the 1990s (Vorhies 1945, Chew 1951, Macfarlane et al. 1960, Young 1976, Valtonen and Eriksson 1977, Meserve 1978, Hanski 1984, Ayoub and Saleh 1998) show that most mammals, when they are exposed to the sun, survive only 3–5 days without drinking. Only desert pocket mice (*Perognathus*), kangaroo rats (*Dipodomys*), and scrub-dwelling rodents (e.g., Darwin's leaf-eared mouse, *Phyllotis darwini*) can do better, surviving over a month without drinking. However, these champions of dehydration are absent from the faunal lists of oceanic islands.

There is an account (Prescott 1959) of a jackrabbit (*Lepus californicus*) found perched on a raft of giant kelp (*Macrocystis pyrifera*) drifting some 15 miles southeast of San Clemente, in the Channel Islands of California. The animal was semicomatose. Vorhies (1945) found that jackrabbits were unable to conserve water to the extent that kangaroo rats and pocket mice do. They satisfy their needs, when drinking water is unavailable, by eating succulent plants. Although the fossil record shows that jackrabbits have been present in western North America for over 1.5 million years, they have never succeeded in colonizing the Channel Islands, located just 120 kilometers off the California coast.

De Queiroz and other supporters of oversea rafting accept that the chances of an animal surviving a transoceanic trip are small, but they propose that, over millions of years, some lucky ones have made it. Who knows, maybe in a million more years, some lucky humans will learn to fly.

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