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CAUTION: NICHE CONSTRUCTION AHEAD[1]

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This fall, I watched as my neighbors waged war on moles (to be fair, it was the wife's mother and aunt, who became known as the ''mole patrol''). It seems the moles were suspected as weapons-of-grass-destruction and were deemed to be dangerous to the way of life of free lawns everywhere. The mole patrol roamed the lawn each evening, pouring all manner of organic and inorganic chemical warfare into the burrows of the unsuspecting moles, setting up conventional implements of physical torture in mole runs, and finally chasing moving tunnels with sharp sticks. To my knowledge, no single mole succumbed to this police action, though I did notice that some crossed borders into a more protective sovereignty and dug up my yard. Not really caring about some dirt mounds in my yard, I found myself instead thinking about the selective forces faced by suburban moles and how their actions modified the microhabitat in which they lived. I did not realize it then, but the moles and the mole patrol they brought down upon themselves through their burrowing behavior are examples of niche construction, wherein organisms modify their surroundings and in doing so, alter patterns of selection. The extended phenotype of the moles—the molehills they created—altered the action of potential predators (the mole patrol). In so doing, the moles indirectly affected the soil environment by causing a variety of chemical cocktails to be poured into the ground. Finally, they relocated to a new and less-challenging selective environment by moving into my yard.

As defined by Odling-Smee, Laland, and Feldman, niche construction occurs ''when an organism modifies the feature-factor relationship between itself and its environment by actively changing one or more of the factors in its environment'' (p. 41). The authors cast a broad net that encompasses such a diversity of biological phenomena that it is hard to imagine a subdiscipline of biology that would not be touched by this concept. As summarized in a lengthy chapter on the evidence for niche construction, virtually all beings, live or dead, fit this broad criterion. Any living organism alters its environment, whether it be as simple and passive as a plant altering the wavelengths of light experienced by itself and others through reflection off of and transmission through its leaves, or as dramatic as the pond habitat created by beavers when they dam a stream. A predator that moves to a new foraging locality when food becomes scarce constructs its niche by relocating and thereby changing the selection it experiences. The mere act of respiration alters the mixture of gases experienced by other organisms in the community. Ironically, death may be an equally important form of niche construction in this framework in that an organism, by dying, alters the nutrient composition of the place that it falls. This return of ashes-to-ashes and dust-to-dust alters the selective environment for those around the corpse and thereby constitutes niche construction. Even branches and leaves falling from trees becomes a form of niche construction by generating fuel for wildfires.

Few ecologists or evolutionary biologists would be surprised to learn that organisms interact with their environment in ways that change both the environment and the organism's perception of it. What, then, is the importance of defining a new concept to encompass all such actions? Odling-Smee, Laland, and Feldman claim that this action of niche construction is a fundamentally different and hitherto unappreciated force in evolution and ecology—a selective force of tantamount importance to natural selection. They argue that the ''Darwinian algorithm'' of variation, heritability, and differential reproduction fails to consider how organisms may modify selection that is experienced now and in future generations. Niche construction is portrayed as an alternative to standard evolutionary theory, one that brings the feedback between evolutionary product and process into play in an explicit way. Unfortunately, the authors' hard sell for the novelty, breadth, and significance of their flagship concept results in a diminished impact for the elements of their theory that are potentially unique and groundbreaking.

The core buzzword of niche construction is *feedback*. Natural selection is depicted as resulting from inanimate and abiotic features of the environment, features that are not changed during the evolution of a population. This version of the Darwinian algorithm was characterized by Lewontin (1983) as a pair of differential equations describing change of an organism (O) and the environment (E) over time (t): $dO/dt = f(O, E)$ and $dE/dt = g(E)$. The key point of these equations is that, while change in organisms depends on features of both the organism and the environment, environmental change is not viewed as being influenced by the organism. Lewontin noted that the second equation should really reflect the fact that organisms change environments, too: $dE/dt = g(O, E)$; such changes in environments may carry forward through time forming a sort of ecological inheritance. This pair of equations then becomes the framework for both the verbal and mathematical models that build the theory of niche construction.

It should be immediately apparent that the differential equations above are extremely general, and this fact allows niche construction to be applied to any situation in which an organism affects change in the environment or the selective nature of the environment. Odling-Smee, Laland, and Feldman spend a large part of their book supporting their con-

[1] *Niche Construction: The Neglected Process in Evolution.* F. John Odling-Smee, Kevin N. Laland, and Marcus W. Feldman. 2003. Princeton University Press, Princeton, NJ. 468 pp. PB $39.50, ISBN 0-691-04437-6; HB $75.00, ISBN 0-691-04438-4.