Paper reconciles two branches of evolutionary science into one framework

February 19 2021

Past behaviors can shape future behaviors by changing the local environment. Small fires lit by Martu hunters in Australia create a habitat mosaic that improves future return rates and may draw hunters back to previously used hunting areas47 (left panel). In the Canadian Arctic, Inuit hunters actively modify their environment in many ways to improve safety, comfort, and access to resources. Hunting shacks such as the one pictured above are generally built in preferred hunting locations; once built they serve as anchor points for travel routes and hunting excursions. Several cabins will often be built in the same location; a phenomenon that appears to be related to a desire for safety and social opportunities as well as resource abundance. More experienced hunters will sometimes seek out less-crowded locations, such as this inland goose hunting camp (right panel). Photos by Elspeth Ready

A review paper published in this week's *Evolutionary Anthropology* reconciles competing approaches in the sciences of human behavior. Co-

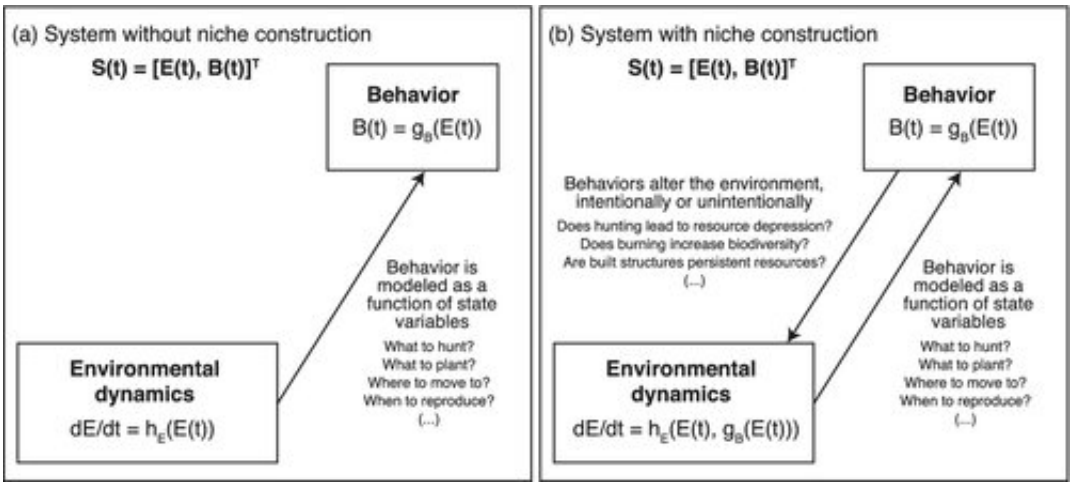
authored by SFI Applied Complexity Fellow Michael Price and Elspeth Ready of the Max Planck Institute for Evolutionary Anthropology, it examines two branches of evolutionary science that are often regarded as rivals and presents a general framework to reconcile them.

The authors hope it will serve as a guide to evolutionary human scientists, especially graduate-level archaeologists and anthropologists.

The first approach, niche construction theory (NCT), focuses on how humans modify the landscape around them to create a foothold in evolutionary space. NCT originated in evolutionary biology. In a seminal 2003 book on the topic, SFI External Professor and Science Board Fellow Marc Feldman, former SFI Science Board member Kevin Laland, and John Odling-Smee defined it as "the process whereby organisms, through their metabolism, their activities, and their choices, modify their own and/or each other's niches."

According to Price, when the concept of niche construction was ported from evolutionary biology to archaeology and anthropology, it lost much of the mathematical machinery inherent in Feldman, Laland, and Odling-Smee's work that allowed for precise predictions.

The second approach, Human Behavioral Ecology (HBE), starts from "the idea that organisms should attempt, however imperfectly, to behave in ways that maximize their fitness," write Price and Ready. As used in archaeology, HBE is more analytical and predictive than NCT, and often associated with simple models for how people foraging for food would decide which prey to hunt for, given the energetic trade-offs.



Schematic of a simple evolutionary system, S, with two state variables (B, behavior, and E, environment). HBE models, represented by the function gB in the "behavior" component, focus on predicting behavior using a limited set of variables; for instance, based on the current environment, represented by an arrow from environment to behavior in the diagram. Change in the environment through time (dE/dt) is represented by the function hE, which can also take a variety of inputs. For instance, in panel (a), representing a non-niche construction model, the impact of the organism on the environment is considered negligible. In (b), change in the environment is also influenced by the action of the organism on the environment, producing a niche construction model with an embedded HBE component. Credit: *Evolutionary Anthropology: Issues, News, and Reviews* (2021). DOI: 10.1002/evan.21885

So which is the better approach? Both, according to Ready and Price. They see HBE and NCt as special cases of a broader framework of human behavior. They advise perplexed scientists to transcend the either-or decision and to craft the best model for their data.

"What we hope is that people are going to basically be inspired to make good models that they can test with the data they have," Price says. "If they're doing the models and making their assumptions very clear, I think I would be pretty indifferent to whether they call it one approach

versus the other."

"Human behavioral ecology and niche construction," is published in *Evolutionary Anthropology*.

More information: Elspeth Ready et al. Human behavioral ecology and niche construction, *Evolutionary Anthropology: Issues, News, and Reviews* (2021). DOI: 10.1002/evan.21885

Provided by Santa Fe Institute

Citation: Paper reconciles two branches of evolutionary science into one framework (2021, February 19) retrieved 26 April 2024 from https://phys.org/news/2021-02-paper-evolutionary-science-framework.html

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