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A Forum for Integrating the Life Sciences

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Integrating Evolution into Long-Term Ecological Research

The US Long-term Ecological Research (LTER) Network has established a long history of primarily site-based research with a strong emphasis on ecosystem processes, including the ecological impacts of climate change that will be the subject of an upcoming Special Feature in *BioScience*. The focus on ecosystem processes makes sense given the historical foundations that led to the establishment of the LTER Network. In the 1960s, ecologists were inspired by the success of the International Geophysical Year (1957–1958). A plan was hatched to try something similar for ecology, which resulted in the International Biological Program (IBP). During planning meetings, the IBP leadership settled on a goal to conduct biome scale studies of ecosystem productivity given its direct and indirect impacts on human well-being. The decision to narrow the scope of studies to productivity disenfranchised many ecologists with interests in population and evolutionary ecology. Nevertheless, ecologists in the United States organized and successfully lobbied Congress for the funds to participate in the IBP, and the funds were administered through the US National Science Foundation (NSF). The IBP, which ran from 1967 to 1974, established “Big Ecology,” as wonderfully described in the book by that title written by ecosystem ecologist Dave Coleman.

After the IBP ended, NSF organized workshops in 1977, 1978, and 1979 to determine how to allocate the funds formerly dedicated to IBP research. These workshops provided the justification, core areas of emphasis and basic structure for conducting long-term, site-based ecological research. The core areas, which focused on primary productivity, nutrient cycles, organic matter dynamics, population dynamics, and disturbances, were chosen to allow comparison across sites. Following these workshops, in 1980, the Division of Environmental Biology at NSF issued the first call for proposals for Long-term Ecological Research. Additional requests for proposals were issued in 1982, 1984, and 1988, resulting in 19 long-term ecological research sites, 14 of which are still active today. Starting around 1990, additional calls for LTER sites were targeted toward ecosystems that were not well represented in the network (Antarctica, marine, urban). Many of these sites are funded by other sections in NSF (Biological Oceanography, Polar Programs). Currently, there are 27 research sites in the LTER Network along with a coordinating office and a data center.

Although the LTER Network has traditionally focused primarily on ecosystem processes, LTER sites represent an unprecedented resource that could support coordinated, long-term research on evolutionary processes, given their history of long-term environmental monitoring, field experiments, and observational population-level data. However, LTER sites remain underutilized for studying eco-evolutionary responses to global change. All of this may change soon thanks to a recent series of workshops aimed at integrating evolutionary perspectives into long-term ecological research programs. The goal of these workshops is to establish a dialogue among ecologists from LTER sites and evolutionary biologists from a range of career stages. Logically, eco-evolutionary research will be enhanced by long-term studies, and integrating evolutionary research within a data rich network of LTER sites makes a lot of sense. Leveraging LTERs to gain insights to evolutionary responses to global change will assist with predicting how ecosystems will function in the future, as there are likely unknown eco-evolutionary feedbacks yet to be discovered.

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