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Pluralism in Ecological Research

In 1987, one of my ecological heroes, Robert McIntosh, wrote the review "Pluralism in Ecology" in the *Annual Review of Ecology, Evolution, and Systematics*, making a plea for just that. Responding to what was offered as "new ecology" at the time, McIntosh argued the need for "tolerance of different methods and even of different philosophies of doing ecology." I am tempted to believe that this philosophy is welcomed by most ecologists today, but I might be naive. One bit of evidence supporting the notion of pluralism is provided by the way ecologists actually go about doing research. Collectively, we use a variety of methods, including long- and short-term field experiments, greenhouse experiments, modeling, synthesis and meta-analysis, and—most recently—distributed, coordinated experiments.

In this editorial, I want to focus on distributed, coordinated experiments. These experiments are designed from the bottom up, often by a small group of coordinators, and the work is performed on a voluntary basis by researchers around the world. A great example is the Nutrient Network (NutNet; https://nutnet.org). Distributed experiments are generally built around relatively straightforward questions, such as how nitrogen addition affects grassland diversity, which can be addressed with very simple and mostly inexpensive designs to encourage broad participation. Recently, we shared our thoughts on why distributed, coordinated experiments must go global (https://doi.org/10.1093/biosci/biab033). For example, no one continent covered the range of environmental conditions where a given ecosystem, such as grasslands, occurs around the globe. In that case, we focused on DroughtNet, which is modeled after NutNet.

Bottom-up networks are good for ecology. Such networks create opportunities for broad participation, because the entrance costs are low. Their strengths lie in the cross-site comparison but at the sacrifice of within-site replication. As a consequence of their (more or less) global extent, the results from these experimental networks are thought to be more generalizable than single-site experiments. They also create an international network of participants with similar research interests.

Their success, on the other hand, has the worrisome potential that these networks will become an ecology unto themselves. Network papers increasingly cite other network papers to the detriment of other work on a given topic. There can be too much focus on the global average response to a treatment, which is much less valuable than explaining the variation around that global mean value. And in some instances, network data are used to answer questions they are not well suited for.

I raise these concerns from the inside. Although I am a minor leaguer in NutNet, I have been much more involved in DroughtNet. I believe such networks are a valuable tool in the ecological toolbox, but we need to remind ourselves that all approaches are needed to address important ecological questions. Therefore, the results from network-level science will be most useful when they are interpreted within the context of what we have learned from complementary approaches. Now more than ever, we need pluralism in ecology to address the big ecological challenges facing humanity, as McIntosh advised us more than 30 years ago.

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