

# FORUM

## Specialization Versus Diversification: A Trade-Off for Young Scientists?

Owing to the inherent links between the fields of study that make up the environmental sciences (e.g., terrestrial, aquatic, and atmospheric branches), and because of the growing need to better understand how human actions translate into global change, there is increasing demand for interdisciplinary research where Earth scientists with different academic training or backgrounds come together and approach projects in novel ways. In theory, interdisciplinary research teams are composed of researchers with complementary skills and are thus able to tackle larger research questions or problems. In this essay, we discuss the perceived trade-offs that young scientists face when specializing or diversifying their research programs to best prepare for participation in such interdisciplinary research.

An effective member of an interdisciplinary team should have expertise in at least one discipline. For a young scientist at the start of his or her career, a period of specialization is necessary in order to be perceived as an expert by potential collaborators. At the same time, the success of an interdisciplinary collaboration may be enhanced by an individual's ability to understand and communicate about subject matters outside of his or her immediate area of expertise. For a young scientist, this implies that one should also broaden the scope of one's field of expertise and diversify. Thus, young scientists may prepare themselves for participating in interdisciplinary research projects by either specializing or diversifying their research programs, although a potential trade-off between both may exist.

This article presents ideas that arose from a working group held at the DIALOG VII

Symposium on Dauphin Island, Alabama (<http://www.aslo.org/phd.html>), where young scientists discussed their intentions to specialize or diversify during their careers. DIALOG stands for Dissertations Initiative for the Advancement of Limnology and Oceanography. The symposium brought together 43 recent Ph.D. graduates (6 months to 2 years post degree) across the biologically oriented aquatic sciences whose expertise ranged from freshwater to marine ecosystems, basic to applied research questions, and fieldwork to simulation modeling. Eleven countries were represented (by order of abundance, United States, Australia, Canada, Germany, Japan, Austria, Denmark, France, Mexico, and Spain).

One topic of debate that quickly arose was the perceived trade-off between specializing and diversifying at an early stage of one's scientific career, when one might be searching for, or may have recently landed, a first job. Thus, costs and benefits associated with specialization and diversification as they relate to participating in interdisciplinary research teams were discussed.

By choosing to be more specialized, scientists may become experts in their fields. This might increase their attractiveness as partners in an interdisciplinary project. However, overspecializing may inhibit communication with scientists outside of one's discipline, and it may limit potential funding and collaborative opportunities. By choosing to become more diverse, one may be exposed to a broader scientific community, which may foster collaborations and the development of novel ideas. In contrast, being overly diverse puts one at risk of becoming a 'jack of all trades, master of

none,' which may give the impression to others—including tenure committees, grants panelists, and potential collaborators—that one lacks focus.

In working group discussions, symposium participants perceived specialization and diversification as achievable in three ways: via the techniques scientists use, the systems they work in (e.g., ponds, estuaries, oceans, etc.), and the research questions they ask. Most participants felt more inclined to diversify with respect to techniques and systems rather than with research questions. While it may be beneficial for young scientists to acquire new research tools, and to become exposed to alternative study systems during their postdoctoral tenures, addressing different research questions may better be left to a later career stage when a scientist becomes more established within his or her discipline. It was generally perceived that such diversification was better postponed because the additional resources (time, energy, financial support, etc.) it takes to address new research questions might detract from attaining short-term career goals (e.g., promotions based on publications, etc.), and because funding agencies might be more willing to support 'exploratory, higher-risk' research proposed by established scientists with good funding track records.

Additionally, the decision to specialize or diversify one's research program may be related to the type of employment a young scientist obtains. For example, one symposium participant who had recently accepted a faculty position at a liberal arts college noted that he could view two scenarios occurring with respect to specialization: "(1) The fact that the school has a smaller faculty than at a 'Research I' university will necessitate my developing more diverse research interests to accommodate more short-term undergraduate projects. (2) My time for research will be limited, and I will need to specialize and focus on several key questions/methods."

The degree to which young scientists specialize or diversify in their research programs may also depend on the fund-

ing situation in their country of residence. One participant noted, "Given the lack of research positions within Australia (and funding to do research), it pays to be flexible. Without some willingness to adapt research methods to new systems and research questions, and without a large number of skills in one's toolbox, it would be virtually impossible to find employment within academia."

Therefore, while young scientists may be inclined to diversify during the early stages of their scientific careers, the extent to which this is realized may depend on external conditions. Given the current trends of funding interdisciplinary science, however, symposium participants believe that the careers of many young scientists will benefit from 'keeping some irons in the fire' and developing a diverse research program.

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