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Editorial

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Research Goals, Not Milestones

I recently had the pleasure of visiting 15 universities during the 2014−2015 academic year during my Association of Environmental Engineering and Science (AEESP) Distinguished Lecturer tour. I visited 13 universities in the United States and two overseas (Nankai University in China and KAUST in Saudi Arabia). The meetings with the students were my favorite part of the tour. There is an incredible diversity of students in our environmental engineering programs, perhaps more so than in any other engineering discipline. These students are all bright, energetic, and willing to take risks, but many are wary of an academic lifestyle, mostly because of difficulties they believe they will have in getting funding (and thus, tenure), an impression no doubt set through interactions with their mentors and advisors.

When I asked the faculty at these U.S. universities if the funding situation seemed more difficult these days than in past years, everyone nodded in agreement, but when I asked if the younger (tenure track) faculty in their departments were finding it difficult to get funding, almost everyone said that they had recruited excellent people, and that the young faculty were doing very well! That was surprising, but it was great news for those young academics on the tenure track. However, these discussions revealed the emergence of a different issue of concern for the midcareer faculty, that funding appears to be more proscriptive in goals than in the past, providing reduced opportunities for success in specific research areas over many years.

Getting grants to fund environmental engineering and science research has always been challenging, but increasingly, it seems that the funding calls are becoming fewer in number, and topically much more specific. These topics change direction so quickly that several faculty noted that it was affecting their ability to delve deep into a subject or maintain their students on a set research topic. When projects span only 2−3 years, Ph.D. students will have to be supported on two or more different projects during the course of their studies. While it has been very common that students in the United States might work on one or more grants during their graduate years, when the topics of their funding vary broadly, the "thesis" becomes more of a collection of unrelated studies than a true in-depth investigation of a subject.

Many calls for proposals also seem to be on more applied than fundamental research topics, with the projects awarded as contracts, not grants. Contracts are great when you need something, like 100 widgets, exactly the same or with small changes compared to the previous ones. Contracts come with strict, legally binding deliverables. These deliverables are put into a research contract in the form of "milestones". If you miss a milestone, your funding can be discontinued before the scheduled completion project date. Thus, you could have a project that supports a couple students and a postdoc for three years but ends abruptly after the first year because a milestone was missed. There are many examples at universities where projects suddenly ended due to a missed milestone, or a change in a federal agency funding allocation plans, leaving these researchers with no funding. Contracts with milestones stifle innovation and reward incremental and safe research. If your work on a contract suddenly suggests a new direction of inquiry that may be far superior to the current idea, you are stuck with delivering on the original proposed topic or you risk losing your funding.

A grant is what is needed to support innovative research, and relatively open-topic and longer-term projects (3−5 years) provide a solid platform for discovery. Grants have goals and offer great flexibility in seeking out the best answers to achieve those goals. Contracts are great for consulting firms doing work in very applied areas, where the answers mainly require good hard work, but they are not suitable for topics that require learning and creativity. A higher percentage of funded projects to academics through contracts, as opposed to grants, will result in an erosion of innovation. The National Science Foundation awards grants, and they are the most prized sources of research funding from federal agencies or industry. All federal agencies need to provide a substantial percentage of their awards as grants, on more open topics, to support long-term research and ensure a strong foundation of knowledge that is needed to stimulate creativity and true innovation.

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Notes

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