Expanding the endless frontier

This month, the U.S. Senate is poised to consider legislation that would expand the National Science Foundation (NSF) and strengthen the U.S. science and technology research ecosystem. The heart of the legislation will be the Endless Frontier Act (EFA), a bipartisan and bicameral bill that was first introduced to the previous Congress in May 2020. With some modifications, this legislation could become a landmark achievement that bolsters U.S. competitiveness.

The bill would authorize $100 billion over 5 years for a new Directorate for Technology to support basic science motivated by critical needs, often referred to as "use-inspired" basic research. The initial areas of focus would include artificial intelligence, quantum information sciences, and advanced materials. In addition to other provisions that protect NSF's current mission and budget ($8.5 billion in fiscal year 2021), the bill requires that the Directorate for Technology provide a minimum of 15% of its annual funds to enhance NSF's existing areas of curiosity-driven research in its existing directorates. The new directorate also would fund academic research both by individuals and centers; offer support to undergraduates, graduate students, and postdoctorals; and enable universities to develop new ways to spin off and support companies on the basis of their discoveries and inventions.

Over the past 7 months, a group of scientific leaders that David Baltimore and I assembled* has been reviewing the bill and meeting with key people in Congress. We developed a short list of changes that would better ensure the success of the bill and its intentions. Our concerns are substantial but still minor in comparison with the benefits that the EFA would confer on the nation's science and technology enterprise.

Maintaining NSF's unity of structure is critical—a single director and board that makes certain that the agency's work is greater than the sum of its parts. With this in mind, we do not support a provision in the May 2020 version that creates a Senate-confirmed head of the new Directorate for Technology who might be viewed as outranking the other directorate leaders and possibly competing with the NSF director. As well, a proposed new advisory board that includes congressionally appointed members would be equally disruptive.

The legislation also changes NSF's name to the National Science and Technology Foundation. We recommend that the agency's well-recognized name NSF be preserved unchanged, given its acclaimed history and position in science.

The bill does protect NSF's existing programs, and these could be further strengthened. For example, it prevents the Directorate for Technology from making new grants if budgets for the existing directorates are not maintained. The bill could also stipulate additional funding for these directorates to ensure that NSF's budget does not become too weighted toward use-inspired basic research. And Congress should design the ramp-up of the Directorate for Technology's budget in a manner that gives stability and reasonable predictability commensurate with the long-term nature of basic scientific work.

"This is a rare moment... to enhance the nation's research enterprise..."

The bill's education language should be strengthened to encourage needed experimentation in the way that students are trained. With the country's history of underrepresentation of many groups in science, technology, engineering, and mathematics (STEM), the new bill should promote new ideas garnered from experts in this area to attract diverse students into STEM fields. This is not only the right thing to do but would address the losses that the United States suffers when a substantial portion of the population is not welcomed into the nation's scientific enterprise. Also, the bill should encourage graduate programs to give students experience in industry and government as part of their training, and it should fund more professional, but not high-fee, professional master's programs, especially in engineering.

We urge the scientific community to give the EFA its constructive attention and its vocal support. The Association of American Universities and the Association of Public and Land-Grant Universities both support the bill and provide helpful summaries as a guide. We have provided recommendations to congressional committees as well.

This is a rare moment, a once-in-a-generation opportunity to enhance the nation's research enterprise and adapt it to current challenges for the benefit of the country and the world. We urge our colleagues to engage now.

–Robert W. Conn

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