Innovation Needs Novel Thinking

SCIENCE, TECHNOLOGY, AND INNOVATION ARE CRITICAL DRIVERS OF ECONOMIC GROWTH AND national well-being. As a result, investing in them has become a source of hope for many countries, both rich and poor. But innovation demands that novel ideas be pursued, and the science and technology (S&T) enterprise may not be well structured, in the United States and elsewhere, to attract, recognize, and exploit new ideas. Some long-held traditions and modes of operation need to be reexamined to ensure that the system is optimized as an engine for advancing society’s goals.

Peer review is widely recognized as the best system for choosing among research projects to fund and deciding which papers to publish. However, peer review can be somewhat conservative, particularly when grant support is limited, resulting in the support of “safer” projects over more risky ones that are based on scant pilot evidence. Urging peer reviewers and funders to support more high-risk but also potentially high-payoff or transformative research, which can revolutionize fields, has not worked well, at least in the United States, as pointed out in 2007 by the U.S. National Science Board.* What is needed are more programs like the U.S. National Institutes of Health’s (NIH’s) Pioneer Awards or the U.S. Department of Energy’s ARPA-E program, in which funds are set aside for research that pushes the frontiers in groundbreaking ways. Projects are reviewed by committees charged with evaluating the projects’ potential to be transformative, as well as their overall quality.

Research institutions pursuing high-risk research may have to rethink evaluation timelines and the criteria for judging and rewarding performance. Achieving the goals of a transformative research program can take longer than those of an incremental program designed in a more linear way; transformative research can have many false starts and thus a reduced publication rate. This factor must also be considered by funders, who may likewise need to rethink their criteria for support and for evaluating progress.

Fostering innovation will also benefit from increases in both the number of young scientists and the diversity of the pool of researchers. One of the best arguments for funding more young investigators is that scientists should be enabled to pursue their most creative ideas, which many people believe come earlier in one’s career. There need to be more programs like the European Research Council’s Starting Independent Researcher Grants, NIH’s New Innovator Awards, and the U.S. National Science Foundation’s CAREER grants.

In addition, innovation often comes from nontraditional thinking, and many new ideas will come from new participants in science and engineering who often are less tied to traditional ways. That argues for increasing the diversity of the scientific human resource pool, adding more women, minority, and disabled scientists, as well as researchers from smaller and less-well-known institutions. The benefits of increasing diversity for fostering innovation and economic success have been argued well elsewhere.** Both research institutions and funders need to attend more to these sources of novel thinking and may have to refine recruitment, reward, and funding systems accordingly.

These kinds of systemic adjustments in the major S&T-performing and -funding institutions will be hard to make, particularly in the face of severe budget cutbacks that threaten ongoing research programs in many parts of the world. Making these changes will require leadership and courage at the highest levels of S&T institutions. But if the S&T community is going to continue to deliver on its part of the promise that has led to the belief that science, technology, and innovation will be the source of future well-being, changes will have to be made.

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Editor's Summary

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