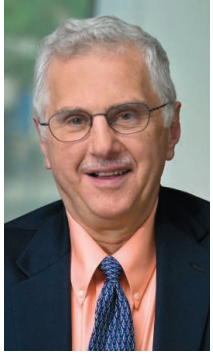

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On Incentives for Innovation

FOR SCIENCE TO THRIVE, IT IS CRUCIAL THAT THE SCIENTIFIC COMMUNITY ENCOURAGE THE BOLD ambitions and innovative spirit of young researchers. In my own area of science, the United States could do much more to support this important goal. U.S. biomedical science is a large and important research enterprise that currently includes over 100,000 graduate students and postdoctoral fellows. Of these, only a select few will go on to become independent research scientists in academia. Assuming that the system supporting this career path works well, these will be the individuals with the most talent and interest in such an endeavor: young people well positioned to make the scientific breakthroughs that societies need to survive and thrive. But the current system squanders the creativity and energy of these exceptionally gifted young people through a funding process that forces them to avoid risk-taking and innovation.

The traditional peer review system on which scientists depend for federal grant support values biomedical research projects that are almost certain to "work," encouraging young scientists to pursue a narrow range of projects that closely follow the proven paths of their mentors. As a result, many scientists pursue identical research ideas, creating a competition to finish and publish that can value speed over quality. Worse, the innovation that is essential for keeping science exciting and productive is replaced by a great deal of "me-too" science: research that has little chance of producing the breakthroughs needed to improve human health.

The U.S. National Institutes of Health (NIH) is by far the largest funder of research in this area, with a budget of about $30 billion per year. There, a scientist's proposal for research support is reviewed in about 200 "study sections"—with titles such as Anterior Eye Disease or Vaccines Against Microbial Diseases—each composed of scientists with a particular expertise. In 2007, frustration with how this generally conservative, risk-averse review process has dampened creative career paths led to the creation of the NIH Director's New Innovator Award. As one of many reviewers for this new program, I was asked to rank 35 10-page applications. To be eligible, an applicant must have received a doctoral degree no more than 10 years previously. Each investigator was asked to propose "highly innovative approaches to a high-impact problem," with no preliminary data required. In addition, an explanation was requested for why this work was unlikely to be funded through normal review mechanisms.

Often presenting bold, original ideas, these applications were a pleasure to read, and I thought that at least 4 of my 35 should have been funded. But with 2200 applications received for the 30 awards offered, not a single scientist on my list was selected. This year, a total of 54 of these 5-year grants were awarded, with projects that range from "A Biochip for Point-of-Care HIV/AIDS Diagnosis in the Developing World" to the "Intracellular Delivery and Targeting of Nanoparticles."*

The New Innovator Award and two others that specifically encourage innovation (NIH's Pioneer and Transformative R01 Awards) make a big difference to those who receive them. But there are far too few to change the culture for scientists starting new labs. Most remain unwilling to take the risk of pursuing ambitious ideas, recognizing that extensive preliminary results will be required to obtain funding from a traditional study section.

NIH has committed $80 million to support New Innovator Awards for 2010. One can ask whether this investment of only 0.27% of the NIH budget is appropriate. To me, the answer is a definite no. A major increase in the number of these 5-year awards to, say, 500 each year would send a very different signal to young people by supporting a culture of innovation and thus the long-term health of the scientific enterprise. Private foundations (for example, the Howard Hughes Medical Institute and Wellcome Trust) continue to promote initiatives that support creative and transformative research.** National governments should take serious note. **– Bruce Alberts**

10.1126/science.1184848

*http://nihroadmap.nih.gov/newinnovator/recipients09.asp. **]. Kaiser, *Science* **326**, 921 (2009)

Published by AAAS