

Society Is Ready for a New Kind of Science— Is Academia?

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In her 1998 essay in *Science* (<http://io.aibs.org/sci1>), Jane Lubchenco boldly called for a new “Social Contract for Science,” one that would acknowledge the scope and scale of environmental problems and have “all scientists devote their energies and talents to the most pressing problems of the day in proportion to their importance.” We were entering a new millennium, and Lubchenco was worried that the scientific enterprise was unprepared to address the challenges related to climate change, pollution, health, and technology.

Here we are, 20 years later, and our global challenges have only grown in complexity and urgency. Never before have we had such a clear understanding of our environmental crises and yet also been so far from delivering the investment in actionable research that Lubchenco called for. If the March for Science is any indication, researchers are ready to engage. But will universities—both leaders and the faculty who govern—acknowledge the need for reform?

Academic institutions are increasingly seen as elite enclaves, out of touch with real-world problems, conducting research in isolated bubbles. We cannot afford to wait decades more for universities to provide the infrastructure and foster the culture needed to turn ideas into action. If we want science to serve society and the planet, as Lubchenco argued it must, then we all must take responsibility for institutional innovation in five key areas. We must do the following:

1. Produce not only professors but also future environmental leaders

Few faculty members can serve as mentors for students interested in real-world problem solving, because most do not engage in use-inspired science or actively cultivate relationships with external practitioners. Employers are increasingly demanding hybrid skill sets (<http://io.aibs.org/ec1>), but most graduate programs produce individuals with highly specific training and uncertain job prospects (<http://io.aibs.org/he1>). More faculty conducting applied work will help, but institutions can do their part by incentivizing partnerships between scientists and “boots-on-the-ground” practitioners and providing training and career paths for scientists whose focus is communication and engagement with business, government, and communities.

2. Cultivate a culture that values use-inspired research

In many basic-science departments, research with immediate relevance to societal issues is seen as second-class work. But the problems of the real world are wondrously complex. They entail conflict, trade-offs, institutions, and relationships. Instead of being mundane, they require a level of creativity that matches the most abstruse theoretical physics. Scientists need mentoring on how to codevelop research with external partners and a greater appreciation for the time and resources required to effectively engage. And if scientists invest the time and resources

needed to understand the needs of end users, then universities must incentivize this work by removing barriers and rewarding those who deliver real-world impacts in promotion and retention decisions. The bias against applied science needs to go extinct.

3. Move ideas into action faster

The “price we pay for precision,” wrote Nobel Prize-winning economist Douglass North, “is an inability to deal with real-world problems.” If we have learned anything from the climate-change debate, it is that a small degree of uncertainty is not an excuse for inaction. Academics should emulate the tech sector and employ tools from design thinking to rapidly prototype ideas and iterate solutions with end users. Decision-makers and risk analysts can help researchers determine when we know enough to take action and what the risks are for inaction. When science is paralyzed by precision, society misses out on potential solutions.

4. Put people at the center of environmental science

People make decisions, people shape policies, and people face the consequences of environmental change. However, individuals and communities are largely sidelined in environmental research, too often seen as passive recipients of knowledge or as objects of study rather than as true research partners. Recent calls for scientists to “establish dialogues” (<http://io.aibs.org/ensia>) with the wider world

are valid, but they fail to acknowledge decades of applied work at land-grant institutions and by social science on the human dimensions of natural-resource issues. Putting people front and center in environmental science requires natural scientists to prioritize equal partnership with the social sciences, arts, and humanities and with researchers from diverse backgrounds. Authentic partnership with individuals and communities can also expand the frontiers of traditional disciplines, leading to new insights. At the same time, reframing environmental problems in terms of their impact on people will broaden the uptake of research, attract new partners, and increase media coverage.

5. Reimagine academic structures to encourage innovation

Many environmental scientists are housed in discipline-specific departments with few incentives to collaborate; even fewer engage meaningfully in the broader world. Faculty tenure standards and academic administration, finance, and legal departments move slowly, whereas external decision-makers need fast-paced, time-sensitive solutions. Even within land-grant institutions, applied departments (agriculture, natural resources, and agricultural economics) are separate from basic departments (biology, ecology, and economics). Progress will come in the form of outward-facing units such as those represented by many of the coauthors, university infrastructure dedicated to bridging science to practice, and new positions that reward impact and engagement. When institutions support and incentivize work of societal relevance, researchers will not have to wait until tenure to explore controversial topics and to develop the partnerships that lead to long-term engagement and discovery.

There are signs of progress—seeds of change taking root in universities around the world (www.youtube.com/watch?v=551FQJXAiq0). For example, impact-oriented training programs for students (<http://smconservation.gmu.edu>), faculty (<http://ncep.amnh.org>),

and leaders of all sorts (<https://woods.stanford.edu/educating-leaders/leadership-programs>) are expanding in response to demand for applied skills. University and nongovernmental-organization partnerships and industry–university links have led to a number of innovations, including the development of technologies that detect and mitigate methane leakage (www.edf.org/climate/methane-studies); new approaches and open-source software tools that enable leaders to account for nature's contributions to society (www.naturalcapitalproject.org); and the adoption of new financial models designed to fight poverty (<http://io.aibs.org/vet>) and expand access to clean energy (<https://energy.duke.edu/global-energy-access>). In all of these cases, the ingredients for success were the cultivation of partnerships, buy-in from university leadership, and researchers with the expertise and persistence to codevelop solutions with end users. Other bright spots include action-oriented policy institutes (<https://nicholasinstitute.duke.edu/el>) that link academics with decision-makers, the adoption of new impact-oriented metrics to evaluate the quality of academic research (<http://www.ref.ac.uk>), and university-sponsored grants employing evaluation criteria that prioritize societal impact over publications (<http://io.aibs.org/spln>).

Isolated initiatives, however, will not deliver solutions at the scale needed to address the most formidable challenges of our time. We need systemic change spanning incentives, culture, and research design in order to cultivate a generation of scholars who will increase the reputation and influence of academia. It is time for university presidents, provosts, faculty-governance officials, and philanthropists to double down on the interdisciplinary, solution-oriented work that this complex, problem-filled world needs.

Last month, Jane Lubchenco reiterated her call (<http://io.aibs.org/lub>) for a “quantum leap into relevance” driven by greater engagement and institutional reforms that recognize

and reward societal impact as a core responsibility of academia. We are living in times of revolution on many fronts. Perhaps one of them can be to reinvent our centers of learning—to ensure their relevance and to harness their power to address the critical challenges of our time.

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doi:10.1093/biosci/bix051