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Organizing Teaching and Research to Address the Grand Challenges of Sustainable Development

MICHAEL M. CROW

Academic culture has not evolved sufficiently in its ability to mount adequate responses at scale and in real time to the progressively accelerating complexity that marks contemporary life. This lack of adaptive capacity is nowhere more evident than in the institutional posture of our research universities when they are confronted by the need to address grand challenges—one need only think of global climate change, air and water pollution, overpopulation, hunger and poverty, extinction of species, exhaustion of natural resources, and destruction of ecosystems. A response commensurate to these problems will require that we advance research on sustainable development, by which I mean the efforts we must undertake to balance the generation of wealth with continuously enhanced environmental quality and social well-being. Building the capacity of our colleges and universities to respond to the challenges of sustainable development thus requires that we rethink our academic institutions.

Even before the advent of organized science and the formation of the modern research university, our intellectual progenitors understood the need to think at scale and across time. Four centuries of scientific focus on the ever-narrower and more fundamental secrets of nature have seemingly impaired our ability to do so. Our narrowing focus has also diminished our ability to construe teaching and research between and among the disciplines. Meanwhile, through our increasingly sophisticated manipulation of limited knowledge, coupled with brute force and an astonishing measure of hubris, our species has shaped a world that in all likelihood cannot sustain our collective standard of living.

Our potential to attain a conception of research sufficiently expansive to address the challenges of sustainability requires that we recalibrate the structure and practices of our academic institutions. Although American research universities retain their global dominance in discovery, innovation, and creativity, their adaptive capacity is threatened by progressive ossification. As I use the term, "ossification" refers to the preponderant lack of innovation in the organization and practices of our colleges and universities. This structural ossification perpetuates longstanding "design flaws" and encourages the institutionalization of new organizational impediments to institutional evolution.

Rather than exploring new paradigms for inquiry, academic culture too often restricts its focus to existing organizational models. Perhaps the most obvious symptom of ossification is the perpetuation of the discipline-based departmental structure that we now take for granted. Entrenchment in disciplinary silos undermines our drive to develop formal languages comprehensible to practitioners of other disciplines. The lack of innovation in the configurations of our colleges and universities is matched by insufficient differentiation between distinct categories of institutions. Research-grade universities are one of many institutional types in American higher education, but even such institutions must develop distinctly different competencies if we are to have a robust national system of innovation.

Academic culture assumes that our research enterprises are somehow inherently calibrated to not only promote discovery but also to seek knowledge with purpose, and to link that useful knowledge with action for the common good. Instead, our universities too often perpetuate an inwardly focused academic culture that privileges the pursuit of new knowledge, with little concern for its purpose and application. While we valorize the discovery of the unknown by individual scientists, we attach less prestige to collaborative endeavors that target real-world problems, and to team participation in projects that accomplish assessment, assimilation, synthesis, implementation, and application. Scientific research conducted with application and social context in mind—outcome-driven science, or science with purpose—should be granted equal accord with fundamental research.

As president of Arizona State University (ASU), I have led an effort to reconceptualize the youngest of the roughly one hundred major research institutions in the United States through a comprehensive "design process." This reconceptualization represents an effort to pioneer the foundational model for what we term the "New American University"—an egalitarian institution committed to academic excellence, inclusiveness to a broad demographic, and maximum societal impact—but also constitutes a reexamination of academic operations and organization. Our objective has been to accelerate a process of institutional evolution that might otherwise have taken more than a quarter-century and compress it into a single decade (2002–2012). Sustainability is at the core of this conception, not simply because interdisciplinary research on human-dominated environmental systems has long been one of the strengths of the university, but because we deemed it an implicit institutional commitment.

With the establishment of the Global Institute of Sustainability (GIOS) in 2004 and the first-of-its-kind School of Sustainability three years later, ASU has positioned itself in the vanguard of interdisciplinary research

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on environmental, economic, and social sustainability. The institute brings scientists and engineers together with government policymakers and industry leaders to share knowledge and develop solutions to pressing real-world problems. With research in areas as diverse as agriculture, air quality, marine ecology, materials design, nanotechnology, policy and governance, renewable energy, risk assessment, transportation, and urban infrastructure, the faculty members affiliated with GIOS are addressing some of the most critical challenges of our time, as well as training future generations of scholars, scientists, and practitioners. Our sustainability initiatives also provide a framework to develop productive partnerships with a number of premier institutions around the world, including Stanford, Harvard, Massachusetts Institute of Technology, the University of Washington, Tec de Monterrey, and Cambridge.

To prepare students to integrate a broad range of disciplines in a rapidly changing knowledge economy, the School of Sustainability offers both undergraduate and graduate degree programs. The school is educating a new generation of leaders through collaborative, transdisciplinary, and problem-oriented training that addresses environmental, economic, and social challenges. Teaching and research seek adaptive solutions to such issues as rapid urbanization; water quality; habitat transformation; the loss of biodiversity; and the development of sustainable energy, materials, and technologies.

The impetus to reorganize and recombine discipline-based academic departments had already gained a foothold at ASU even before the design process was under way. An ambitious reorganization of the biology faculties to overcome disciplinary boundaries, for example, epitomized the momentum. In July 2003, the departments of biology, microbiology, plant biology, and the program in molecular and cellular biology merged to form the new ASU School of Life Sciences. The school allows more than one hundred life scientists, engineers, philosophers, social scientists, and ethicists to self-organize around the great socially and environmentally relevant questions of the day.

Through the reorganization of the university, we have sought to produce a model of differentiation. Rather than advancing a trajectory model that would guide evolution according to linear extrapolation, or a replication model that would attempt to re-create the organizations of leading research universities, we chose to pursue a distinctive institutional profile by building on existing strengths to produce a federation of unique colleges, schools, interdisciplinary research centers, and departments, with a deliberate and complementary clustering of programs at each of our four campuses. With "school-centrism," schools compete for status not with other schools within the university but globally with peer entities.

More than a dozen new transdisciplinary schools, including the School of Human Evolution and Social Change, the School of Earth and Space Exploration, and the School of Sustainable Engineering and the Built Environment, complement large-scale initiatives such as GIOS and the Biodesign Institute, focused on innovation in health care, energy and the environment, and national security. In the process, we have eliminated a number of traditional academic departments, including biology, sociology, anthropology, and geology. Transdisciplinarity trumps arbitrary constructs that may once have served certain social or administrative purposes but that are no longer useful.

While GIOS remains our front line of engagement in sustainability, we are engendering an institutional culture of sustainability. Arizona State University offered sustainability-themed courses in more than two-dozen subject areas during the past academic year, such as anthropology, architecture, biology, economics, engineering, industrial design, law, philosophy, nonprofit leadership, and urban planning. A further objective is to engage the community in supporting sustainability initiatives, including widespread reductions in greenhouse gas emissions. In terms of operational sustainability, ASU has made major investments in energy-efficiency infrastructure. These efforts helped advance the university's carbon-neutral goal and reaffirmed its leadership position in the American College and University Presidents' Climate Commitment.

Along with guiding principles of modern societies such as human rights, sustainability is an epochal issue that must be addressed by the citizens of a planet whose population already exceeds 6 billion and that is projected to approach 10 billion. Organizing research and teaching efforts to seek solutions to the grand challenges associated with sustainability represents an important dimension of such an imperative. Through research and teaching associated with sustainability, ASU has sought to design a prototype both for deliberate institutional evolution and large-scale academic reorganization to tackle some of the most intractable challenges of our era.

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