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Building Pluralistic Intelligence Into the American Research University

To respond to challenges in society, sustainability, and governance, universities must first deal with the mismatch between how knowledge is actually generated and what academia recognizes and teaches.

As they were designing the Apollo lunar module, engineers discovered that equations and drawings could not fully predict how the spacecraft would function. But when they built full-scale mock-ups and climbed inside, tracing systems by hand, they revealed conflicts invisible in diagrams but that became obvious once they physically experienced the spacecraft. Similar dynamics occur in medicine: Surgeons developing minimally invasive procedures rely on simulation labs and physical models, where hands-on knowledge is key. Solutions emerge not from calculation alone, but from spatial reasoning, embodied understanding, and shared interpretation.

Examples like these are well documented in science, engineering, and medicine, often arising precisely when analytic tools appear exhausted. The value of these nonanalytic approaches is widely recognized—even popular hospital dramas feature patients diagnosed not by additional tests but by the tacit knowledge of an experienced clinician. Similarly, many scientific breakthroughs are based on insights other than pure analysis.

Yet universities remain organized as if analytical and verbal reasoning were the only legitimate forms of intelligence. This mismatch—between how knowledge is generated in practice and how institutions are structured to recognize it—reveals a deeper tension within the modern research university. We describe this problem as an *epistemic monoculture*.

When institutions privilege a narrow range of cognitive practices as legitimate knowledge, they marginalize the exploratory, embodied, and relational forms of intelligence through which innovation often emerges. Just as a monocultural crop crowds out the biodiversity that makes an ecosystem resilient to adversity, failing to embrace intellectual and institutional diversity constrains the ability of research universities to respond to societal, political, economic, or environmental challenges.

Monocultures do not eliminate alternative ways of knowing; they simply push them outside formal recognition. Consider engineering education. Engineering students are often trained to optimize solutions before they have learned to explore the problem space. Mathematical elegance is rewarded, while early-stage prototyping is treated as secondary or remedial. Yet in professional practice, engineers routinely rely on iterative making—building, testing, and revising—to uncover constraints that no model can fully anticipate. When universities marginalize this form of intelligence, they do not produce

Illustration by Shonagh Rae

better analysts; they produce brittle problem-solvers.

This tension has profoundly shaped the late twentieth- and early twenty-first-century research university, but it may be even more consequential for its future. Embodied, spatial, relational, and interpretive forms of intelligence, which fall outside the analytical-verbal norms universities are designed to privilege, are essential to research that benefits society. And as artificial intelligence and large language models become increasingly capable of analyzing and generating text, the human learning that shifts elsewhere offers a comparative advantage. Universities must therefore design educational environments that cultivate forms of intelligence that machines cannot easily replicate: tacit sensemaking, visual and spatial reasoning, experimental and design thinking, and the relational intelligence required for collaboration. These capacities reflect a more pluralistic understanding of intelligence, one that recognizes that discovery and innovation arise from many modes of knowing, not analytical reasoning alone.

outputs may be hard to count, standardize, or rank. Generation after generation, the signal is unmistakable: Some kinds of intelligence advance careers, while others—even when essential to discovery and impact—remain institutionally invisible.

The central challenge, then, is not simply engendering intellectual diversity, but revising the definition and appraisal of the forms of intelligence institutions choose to recognize and reproduce. In other words, diversifying the knowledge that universities privilege requires addressing the problem as one of systems design. Simple critiques of curricula or exhortations for change are not sufficient to shift the system's structure. It is more helpful, we think, to consider the university as a legacy operating system built for an earlier age. From that perspective, the system architecture itself must be redesigned to cultivate pluralism—of knowledge, talent, and institutional purpose—so that research universities remain vital public assets able to mobilize knowledge at scale.

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An inherited epistemic design

Modern disciplinary specialization has long been tied to what can be written, defended, and peer-reviewed. This preference has persisted because institutional systems—curricula, assessment, hiring, and promotion—were built to recognize these ways of knowing. Over many generations, this cognitive bias solidified into an inherited architecture that universities now treat as natural rather than contingent. Large language models now replicate this hierarchy in computational form, extending an institutional design choice into the digital systems that increasingly shape knowledge production. Whatever the reasons that multiple knowledge architectures came to support this particular hierarchy of cognitive abilities, it may now be approaching the limits of its historical utility.

As the bias toward analytical thinking became bureaucratized in universities, it has also become self-perpetuating as it rejects alternative visions. For example, curricula that include studio-based learning, community-embedded research, and project-based courses are often labeled "experiential" and positioned as complements to "real" academic work. Faculty who invest in these modes frequently find their efforts are misunderstood or not fully credited in promotion and tenure reviews, where their

Breaching the monoculture equilibrium

The question, then, is whether research universities can be redesigned to recognize and cultivate a broader range of intelligences. Over the past two decades, Arizona State University (ASU) has undertaken an academic reorganization intended to do precisely that, beginning with the formation of dozens of transdisciplinary colleges, schools, institutes, and research centers reconfigured according to broad societal challenges rather than historically entrenched disciplines. ASU's School of Earth and Space Exploration, for example, integrates geology, astrophysics, planetary science, engineering, data science, and instrumentation, demonstrating that plural epistemologies can be structurally embedded within a single academic unit while maintaining scientific rigor.

Over time, ASU has repeatedly restructured itself, creating and dissolving units, forming new partnerships, and revising designs in response to emerging conditions. This institutional transformation should be understood less as a linear planning exercise than as an iterative design process—one that legitimates experimentation, tolerates ambiguity, and enables multiple forms of intelligence to coexist productively. These shifts have

not eliminated internal tension; they have made it visible. But that tension itself signals a breach of monocultural equilibrium. ASU still struggles with its inherited epistemic destiny, but it has broken through that legacy in observable ways, demonstrating that pluralistic institutional design can function within—and reshape—the research university as it exists today.

Incubating new organizational forms to meet the complexity of the moment

ASU's institutional experiments speak to a recurring pattern. When societies confront problems whose complexity exceeds disciplinary boundaries, new organizational forms tend to emerge. Mid-twentieth-century collaborations such as the MIT Radiation Laboratory and the Manhattan Project demonstrated how academic, governmental, and industrial expertise could be temporarily reorganized into transdisciplinary structures capable of accelerating discovery under conditions of urgency and complexity.

A parallel evolution unfolded in industry, most notably at AT&T's Bell Laboratories, where a deliberately transdisciplinary research culture brought physicists, engineers, mathematicians, and materials scientists into sustained collaboration. The invention of the transistor there in 1947—along with subsequent advances in information theory, computing, and communications—illustrated how organizational environments that integrated diverse forms of expertise could generate foundational technologies that helped catalyze the emergence of today's knowledge economy.

Taken together, these precedents suggest that innovation at scale depends less on isolated discovery than on institutional architectures capable of sustaining epistemic diversity around shared problems. Contemporary large-scale initiatives are institutional descendants of these experiments but increasingly orient inquiry toward long-horizon societal challenges—health, climate, sustainability, and resilience—requiring institutional architectures capable of sustaining openness, public accountability, and a broader epistemic range under conditions of growing systemic complexity.

For example, University College London's Grand Challenges program, launched in 2008, advanced an integrative ambition, demonstrating how institutional frameworks can be designed to bring together diverse forms of expertise to address complex societal problems. Initially organized around global health, sustainable cities, cultural understanding, and human well-being, the program was later expanded to encompass justice and equality, mental health, climate crisis, and data-empowered societies.

In medicine, a need to advance medical practice and patient care at the same time led Texas A&M University's School of Engineering Medicine to produce "physicianeers." By offering simultaneous MD and MS in engineering degrees, the school treats health care challenges as engineering problems, encouraging students to translate identified clinical needs into practical, technology-driven solutions through sustained collaboration with clinicians, researchers, and industry partners. Its approach centers on interdisciplinary synthesis, valuing real-world application and iterative innovation.

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Comparable approaches have emerged in industry. IDEO, a global design and innovation company, has institutionalized human-centered design methodologies that prioritize empathy, observation, rapid prototyping, and iterative learning. Its processes—applied to projects as varied as Apple's first mouse, foot-powered water pumps for Kenyan farmers, garment worker health programs, and even supersonic aircraft—depend explicitly on tacit insight, relational intelligence with users, and embodied experimentation through mock-ups and scenario-testing. IDEO's widely disseminated design-thinking framework has influenced universities, corporations, and governments to recognize creative and experiential cognition as indispensable to innovation.

At ASU, we've been working to institutionalize transdisciplinary collaboration at the Julie Ann Wrigley Global Futures Laboratory since 2019. Instead of aggregating expertise within single-discipline departments, the laboratory is structured around complex challenges that resist reduction to any single field or mode of inquiry: planetary habitability, climate resilience, sustainability, and human well-being. Bringing together more than 70 specialized units spanning science, engineering, the humanities, the social sciences,

and policy, the Global Futures Laboratory sustains an organizational environment in which epistemic pluralism is not incidental but structural. Problem-framing becomes a shared intellectual task requiring different cognitive styles and forms of expertise to interact over sustained periods. In this sense, the laboratory represents an alternative institutional architecture within the research university—echoing earlier attempts to build new institutional forms in response to complex problems, such as the creation of Bell Labs within AT&T.

Another ASU innovation is the Decision Theater. In this immersive environment, complex systems—urban growth, water management, climate adaptation, public health—are rendered spatially, so that scientists, engineers, policymakers, and community stakeholders can reason together in real time. Visualization here is not illustrative; it is analytic. By transforming data into shared visual environments, the Decision Theater enables collective sense-making across expertise, revealing interactions and trade-offs that no written report or isolated model could surface. In doing so, the design legitimates visual, relational, and collaborative cognition as integral to rigorous inquiry.

Another challenge facing universities today is the rising number of Americans who say the value of a four-year degree is not worth the cost. This skepticism reflects a widespread sense that the traditional postsecondary model is increasingly misaligned with economic realities. For too long, for example, research universities have assumed that higher learning is primarily directed toward students between ages 18 and 24 who study full-time on residential campuses. Yet the pace of technological and social change now requires workers to continually reskill and upskill to navigate emerging sociotechnical systems. Research universities must evolve to meet these needs across people's working lives and varied contexts. Doing so will require moving to more flexible, adaptive models of learning. In addition, as artificial intelligence becomes increasingly capable of analyzing and generating text, the distinctive contribution of universities may evolve toward cultivating the broader human capacities that such systems cannot easily replicate.

As knowledge enterprises, research universities can provide stability, resilience, and renewal in a rapidly changing world. Universities that cultivate diversity of perspective, talent, and method not only strengthen their own resilience, but are better positioned to help societies adapt under pressure. The future of the American research university may ultimately be shaped by whether its institutions can be redesigned to recognize how intelligence operates across domains. Pluralistic intelligence thus emerges not merely as an academic ideal, but as a strategic national imperative. Like the engineers who stepped inside full-scale mock-ups to understand how complex systems actually behaved, universities must now redesign themselves to cultivate the full range of human intelligences on which discovery, creativity, and innovation depend.

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Building a pluralistic university for a complex nation

Today's urgent priorities—technological leadership, climate resilience, advanced manufacturing, public health, and democratic stability—require new approaches combining many types of knowledge alongside analytic rigor. But epistemic pluralism can also help address other challenges that research universities face today: a decline in the public's trust of academic institutions and the knowledge they produce; the need to provide value to workers in an era of rapid social and technological change; and the obligation to serve society.

Obviously, public skepticism toward higher education has complex origins, but it is fueled in part by perceptions of ideological uniformity and cultural insularity. When universities appear disconnected from broad swaths of society, they struggle to sustain public trust and bipartisan support. An epistemic monoculture narrows who participates and which perspectives are recognized, unintentionally reinforcing these dynamics. Redesigning institutional structures so that public engagement and multiple ways of knowing are integral to research and education—rather than afterthoughts—could help rebuild the foundations of public trust.

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