

Request for Proposals for Planning Grants
Grand Challenges Initiative
First Proposals Due February 1st, 2021; Rolling Deadline After

During the spring and fall of 2019, the Research Planning Council (RPC) of the Grand Challenges Initiative engaged the campus and the state to identify major themes for research investment at the University of Wyoming. By their nature, Grand Challenges are large, thorny, interdisciplinary problems of social, cultural, economic, political, or scientific concern. Based on that engagement, the RPC identified five central themes:

- Biodiversity and Earth System Change
- Energy Transition and Economic Diversification
- Rural Health Issues
- Public Trust in Research and Information
- Quality of Democracy and Equality

Please see the attached White Papers for a fuller description of each Grand Challenge theme.

Additionally, UW President Seidel has indicated that the Grand Challenges initiative will provide guidance for the university's future direction, in tandem with his priorities to make the university:

- More digital
- More entrepreneurial
- More interdisciplinary
- More inclusive

The Research Planning Council of the Grand Challenges initiative now invites proposals for Planning Grants with a cap of \$20,000 to develop collaborative research projects based on the Grand Challenges themes and the presidential priorities. We intend these Planning Grants to assist multidisciplinary teams of researchers to build new areas of distinction and also to develop further capacities for current projects. Proposals favored will be those that show high promise for attracting external funding, for serving as the basis for broad, impactful partnership, and for rising to the moment in addressing Wyoming's urgent societal and economic needs.

Proposals must not exceed two pages, including a budget. Proposals must include, and be formatted according to, the following section headings to be competitive:

- **Nature of the Problem:** state the project title, relation to Grand Challenge theme and presidential priority, and give narrative description of research problem to pursue
- **Name(s) of team members:** state names of PI and research team
- **Work plan:** describe work to be completed during planning phase
- **Partners:** list potential extramural partners, granting agencies, philanthropic support
- **Budget:** Include a budget for the project

On **8 January 2021**, via Zoom, we will host an Information Session about the Grand Challenges initiative. On **15 January 2021**, we will host an Engagement session for teams of researchers to deliver lightning talks and to share white papers of 3 -5 pages. These white papers can be early drafts of Grand Challenges proposals. We encourage these white papers and proposals, if applicable, to overlap with other initiatives, including EPSCOR, AMK Ranch, and the Provost's Strategic Investment. Details for these Zoom meetings are forthcoming.

Please address questions about proposals to the Grand Challenges co-chairs:

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Proposals due to Karyn Bercheni (kberchen@uwyo.edu) on **1 February 2021**. Proposals submitted after 1 February will be considered on a rolling basis, pending funding availability. Funds must be spent by 31 July 2021.

The Challenge: Biodiversity and Earth Systems Change

The incredible biodiversity of Earth depends intricately on the physical systems that sustain life and human interactions with nature. Human well-being and the ability to improve standards of living in turn depend on biodiversity, earth's physical systems and how they change over time and space. Efforts to improve standards of living and further develop our societies as human populations grow create impacts on terrestrial, aquatic, and atmospheric systems that must be better understood if we are to reduce the chances of unintended consequences that threaten our sustainability.

While understanding of the processes in the present requires knowledge of the past, given rapidly changing earth systems there is emerging evidence that a systems approach that incorporates processes and mechanisms into predictive understanding of future conditions is necessary. Because biodiversity is a crucial component of ecosystem processes and services to humans, maintenance and restoration of biodiversity must be considered in feedback cycles with earth's physical systems and their impacts on human society and well-being. The goal is to develop practical methods that can be broadly communicated for assessing the earth system wide consequences of human needs that balance with biodiversity and natural resource conservation.

The University of Wyoming's Role in the Solution

The University of Wyoming is nationally and internationally known for the disciplines that are needed to address this grand challenge including: atmospheric science, ecology, economics, ecosystem management, environmental science, evolution, geology, hydrology, indigenous peoples, policy and management, and science communication. This research will require work across these disciplines, bringing together expertise that crosscuts short to long time spans and small to large spatial scales with a combination of empirical and process model development. Testing the models will require harnessing the cutting edge of data science and computational tools. Recent and past investments at UW that must be brought together to address this ground challenge include: data science and high performance computation, genomics, ecological biogeochemistry and isotopes, near surface geophysics, hydrology, biodiversity, natural science collections, entrepreneurship and business incubators, indigenous and local people collaborations, science communication and education, ecology and evolution, environmental economics and management, field stations, and airborne and surface atmospheric and micrometeorological measurements. Dissemination and science communication must be effectively delivered in ways that provide clear evidence that individuals and decision makers can utilize the outcomes of the science. The design, implementation and communication of this grand challenge must also incorporate and respond to diverse viewpoints, including indigenous and local peoples, and contribute to economic development in ways that improve human society and well-being.

Relevance to Wyoming

Wyoming's economy is fundamentally based on earth system processes that have provided an abundance of energy resources, iconic working landscapes, and indigenous and local people who

are cognizant of place. The large gradients in climate and near and deep surface substrates that exist across Wyoming provide an ideal test bed to collect empirical evidence and confront and improve models of how biodiversity and earth system change interact to sustain human well-being. Moreover, Wyoming is at a crucial point in transboundary issues relevant to our national and internationally that intersect with biodiversity and earth system change including: headwaters of three continental river systems that depend on snow, includes some of the last intact ecosystems that allow long distance large animal migration, houses internationally recognized, iconic national parks that attracts people from all over the globe, includes some of the greatest wealth disparities that exacerbate the problems between biodiversity and ecosystem conservation and human well-being of diverse people. These Wyoming specific intersections with national and global relevance make it more likely that the University of Wyoming can attract large federal and private investments.

Correspondence to Presidential Priorities

This grand challenge requires both an interdisciplinary approach that brings together the expertise list above but also the development of new approaches through transdisciplinary efforts. The economy of Wyoming is depending on entrepreneurial work that leverages biodiversity and earth system processes that can only be harnessed through emerging data science and high performance computational approaches. Understanding and incorporating human interactions with biodiversity and earth systems must include indigenous and local people perspectives who will be directly impacted.

Energy Transition and Economic Diversification

The Challenge. Wyoming's economy has long depended upon revenue generated from the extraction of minerals and natural resources. A rapidly evolving energy landscape brings the urgent challenge of diversifying the state's economy and transitioning its energy portfolio. The goal is to help the energy sector thrive through advanced technologies while enhancing and growing other areas of the State's economy to provide a more robust economy with more consistent revenue streams for the people of Wyoming. To do this, we must recognize that our markets and global economies are transitioning toward renewable energy sources in many forms and that major oil companies are accelerating spending on and diversifying into renewable and low carbon energy resources. Closer to home, power generation has shifted toward cleaner thermal fuels; growing political forces across the US are advocating to accelerate this trend. Wyoming's unique blend of people and place provides exceptional opportunities to help define and contribute to this changing energy landscape.

The University of Wyoming's Role in the Solution. As the state's flagship and land-grant institution, UW is positioned to contribute to Wyoming's economic diversification and enhance its energy industries. It is poised to serve as a central leader to work with stakeholders and help Wyoming pivot to a new economy and address fiscal challenges as we address the role of the energy industry in our economy. UW's relatively small size means we know one another and through interdisciplinary work possess a model to address complex challenges facing the state. As a comprehensive university, UW boasts broad expertise to address energy and economic challenges, as well as outstanding expertise in environmental and energy economics, cutting edge research in energy within engineering, geology, and the School of Energy Resources, as well as related expertise and notable opportunities in economics, water law, wind, computing, data science, community development, and more.

Relevance to Wyoming. A long-standing concern has been the out-migration of UW graduates: even when they wish to stay in Wyoming, finding rewarding employment is a struggle. Addressing the challenge of economic diversification, particularly in light of emerging trends in energy, has the potential to deliver clear benefits. Individuals from across the state would benefit from focused educational opportunities that yield employable skills relevant to the 'new' economy. Attacking this challenge is also likely to shed light on necessary adjustments to incentive structures within the state - structures that balance revenue, regulation, and investment.

Correspondence to Presidential Priorities

UW can capitalize on its position as the flagship and land grant institution to use its *entrepreneurial* and *interdisciplinary* strengths to build a strategic 'all university' approach in collaboration with community colleges and stakeholder communities to build economic opportunities for Wyoming citizens. UW can invest in existing interdisciplinary strengths and continue to support interdisciplinary centers, institutes, and programs that address Wyoming-specific problems of space and time (e.g., migration pathways and energy corridors) as well as opportunities in our communities. Wyoming's dispersed population creates challenges but also drives novel ideas for new economic opportunities (e.g., blockchain). *Online* technologies adopted widely since COVID-19 provide resources and expertise that has expanded access to educational

opportunities. Recognizing the uniqueness of Wyoming's communities and sense of place also provides opportunities to address *diversity* and *inclusiveness* by engaging with working Wyomingites and creating economic opportunity for the population as a whole.

The Challenge: Rural Health Issues

Addressing health disparities experienced by rural/frontier populations is a state, national and international grand challenge. While access to care remains an important component of this challenge, it is imperative to consider that the opportunity for healthy citizens starts before the need for clinical care. Wyoming is particularly challenged by premature death (i.e., years lost before age 75) and the percentage of adults experiencing frequent mental distress. Any grand challenge initiative in Rural Health issues needs to take into account the social, economic, physical and policy environments that support or limit healthy choices. Critical challenges in health determinants include the following: (1) **Access to health care** (low numbers of primary care physicians per 100,000 individuals (rank 46th), the high rates of uninsured (rank 44th); (2) **Behavioral health** including high rates of suicide, smoking (rank 35th) and drinking (rank 35th) and (3) **Unintentional injury** (leading cause of death in under aged 44 years). Importantly, health disparities exist for Wyoming's Indigenous populations across health outcomes and determinants of these outcomes. In addition, Wyoming's rapidly increasing older adult population face particular challenges in health care access and high rates of suicide. Workforce development and retention is a particular challenge in Wyoming with shortages across populations and across the care continuum.

The University of Wyoming's Role in the Solution

The University of Wyoming is well-poised to address important Rural Health grand challenges. UW has established relationships with the Wyoming Department of Health and many key stakeholders across Wyoming. UW's faculty and staff have expertise in addressing health disparities across Colleges, departments, and health professions and disciplines (e.g., College of Health Sciences - WWAMI, School of Pharmacy, School of Nursing, Wyoming Institute for Disabilities, Masters in Public Administration; College of Arts and Sciences – Wyoming Center on Aging, Department of Psychology; College of Agriculture - Family and Consumer Sciences, Ag Extension Community Vitality and Health Program) with research and service-related programs designed to address health. Faculty at UW address disparities in health outcomes and determinants of health across the research continuum from basic science to clinical implementation (e.g., suicide, aging syndromes and services, cardiovascular and metabolic disease, addiction among other areas). UW also has strength in research resources (e.g., Wyoming IDeA Networks for Biomedical Research Excellence, Mountain West Clinical and Translational Research Infrastructure Network; ASCEND - Regional Technology Transfer Accelerator Hub).

Relevance to Wyoming

While Wyoming is the 10th largest among the 50 states in terms of surface area, it has the lowest recorded population of any state in the Union (i.e., 578,759 total residents). Population density in the entire state is less than 6 people per square mile (compared to 87.4, nationally) and nearly 75% of Wyoming counties are designated as "frontier" (i.e., 5.5 people/square-mile). Wyoming's relatively small communities are separated by vast distances. To travel for hours on two-lane roads through desolate plains and over mountain ranges is common for the people of Wyoming.

As a result, Wyoming's many rural residents often face barriers to care access. Health is challenged by disparities in educational, infrastructure, and supporting technology.

Correspondence to Presidential Priorities

This challenge relates to all four priority areas. Addressing disparities in healthcare access and outcomes will generate economic and workforce development for Wyoming's new economy, including entrepreneurship, enhanced student experience, and partnerships with companies, communities, and community colleges. Addressing disparities may involve digital technologies such as computing, data science, and AI into all UW programs from science and engineering to the arts, humanities, social sciences, agriculture, and health sciences. Strengthening interdisciplinary research and education, including addressing the grand challenges important to the state of Wyoming and to UW's inclusive mission to create a welcoming campus for students from all walks of life.

The Challenge: Public Trust in Research and Information

Public trust in research and information has been a critically important ingredient in flourishing societies: it has led to major advances in all sectors of society. Yet in our current moment, public trust in research and information is threatened from multiple directions--through the politicization of information, widespread fear of fake news, and/or the very complexity of the issues that top-tier research addresses. A grand challenge of our time is thus reestablishing public trust in research and information so that in all sectors of social and economic life, we can progress on the basis of informed, up-to-date, relevant research.

In order to build trust in research, researchers from every field need to articulate fundamental principles of research, including self-scrutiny and the ongoing quest for ever-more-reliable information; share these principles broadly; and make the research enterprise as accessible as possible to multiple participants. In the U.S. today, curiosity about big questions and a willingness to answer those questions through reliable research remain important means to achieve greater levels of economic and social well-being.

The University of Wyoming's Role in the Solution

The University of Wyoming has the opportunity to play a pivotal role in Public Trust in Research and Information as the Grand Challenges are embraced across campus with outreach coordination. UW can utilize faculty and stakeholders that are willing and able to support PK-12 schools, teachers, and students both on campus and across the state. The university has experts in research and information communication to lean on, and several outreach models already exist on campus including the SMTC, CoE Wyoming-School Partnership, EERB and Libraries Makerspaces, EPSCoR EOD, INBRE, WIHR, Shell 3-D Visualization Center, and the AHC. There is the potential to build on these groups' efforts through an Outreach Center, which could also address other grand challenges. The Outreach Center is a place where the pillars identified by President Seidel coalesce to reach Wyoming, the nation, and an international audience through experts and stakeholders poised to address the Public Trust in Research and Information.

Relevance to Wyoming

This theme is relevant to Wyoming (and by extension, national and international needs) on several levels. Given the current economic struggles the state is facing, and the fact that the sustainability of Wyoming's main revenue sources conflict with what research tells us, it is more important than ever that Wyoming diversify its economy. When the public trusts and is guided by the best available research, effective and successful diversification efforts are more likely. A focus on research and education prepares Wyoming's next generation. As the only university in the state, UW has a unique opportunity and responsibility to lead educational and research outreach. By ensuring students throughout the state have a solid, equal basis of education and exposure to research, UW can prepare the next generation of informed citizenry.

Correspondence to Presidential Priorities

The public communication of research and information is inherently an interdisciplinary process involving researchers, journalists, educators, and other stakeholders. As such, UW's goal to promote understanding and appreciation for scientific knowledge and other forms of critical information requires the participation of faculty, staff, and students from a broad range of departments, disciplines, and campus programs. Given that most current sources of information (and misinformation) are digital and available online, it is essential that Wyomingites learn about and use information source validity in order to make sound decisions. As with all human endeavors, science and other forms of data collection, interpretation, and communication can be subject to bias. Acknowledgement of this fact and the inclusion of well-supported diverse viewpoints leads to a more accurate and holistic appreciation of complex situations. This level of understanding grounds all decision making and provides insights and openings into potential economic and personal opportunities.

The Challenge: Quality of Democracy and Equality

As the Equality State, Wyoming has a proud tradition of civil political discourse and leading the way to a more democratic and just community. We are rightly proud that Wyoming was a pioneer in recognizing women's suffrage. Yet systemic roadblocks stand in the way of fulfilling this promise. Improving the quality of democracy and equality in our communities, as well as strengthening our public institutions and civic organizations, is an intrinsic good; furthermore, cultivating diverse communities by overcoming historical racial, class, and gender inequalities will help each person to reach their potential.

As economist Scott E. Page writes in *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies*, people with diverse perspectives can help us find better solutions and make better predictions; these combinations of perspectives, interpretations, heuristics, and values can aggregate into a whole that is greater than the sum of its parts (374). Put simply, diverse groups--drawing on our whole brains, on our entire capabilities and perspectives--produce benefits that more homogenous groups cannot. Entrepreneurship requires diverse approaches, and we should understand diversity in its broadest range, in cultural, economic, intellectual, and cognitive terms.

This Grand Challenge raises difficult, enduring problems: are our civic institutions adequate to meet our state's needs, especially when those institutions are under pressure? Do University of Wyoming graduates have cultural and essential skills to thrive in an increasingly interconnected, diverse world? How should we understand our state's history, in order to shape its future? How to create a warm and welcoming environment on campus? How specifically to collaborate in ever-deeper ways with the Wind River Tribal Communities? How to position UW to facilitate important conversations about problems in communities across the state?

The University of Wyoming's Role in the Solution

At the core of the Land Grant University mission is a commitment to access, equity, diversity, and inclusion. As Jonathan Baldwin Turner, one of the early advocates for what would become the Land Grant Universities wrote, this type of university "was given to the people, the whole people of the state—not for a class, a party, or a sect, or conglomeration of sects." The Land Grant Universities were designed to produce citizens for democratic communities.

We have some infrastructure built to respond to our state's needs and to fulfil our Land Grant and flagship missions--the Office of Engagement and Outreach, the Cooperative Extension system, and programs like Saturday University facilitate conversations between UW researchers and our state's citizens. We have initiatives such as the Malcolm Wallop Civic Engagement Project, the Wyoming Humanities Democracy and the Informed Citizen Project, as well as initiatives in the Law School and the Haub School and Ruckelshaus Institute, among others. There are curricular initiatives throughout the College of Arts and Sciences, perhaps especially in the School of Culture, Gender and Social Justice, working on these issues. To a significant degree, our faculty and students are nimble, capable, and committed, but we face challenges requiring additional resources.

Relevance to Wyoming

An increasing incivility nationally and in Wyoming jeopardizes the possibility of finding workable solutions to our problems and unnecessarily politicizes academic research, with profound implications to trust in science and healthcare, as well as public safety. Additionally, our state's most valuable natural resource--educated UW graduates--leave the state in disproportionately high numbers, a significant reason for which is the absence of anti-discrimination laws covering our state's workplaces. Furthermore, Wyoming consistently has one of the most unequal gender wage gaps in the nation.

To a significant degree, the University of Wyoming and the state lack an infrastructure that is adequate to respond to these and other needs. Programs for student community engagement and investment in cultural training to combat racism, sexual assault, and other forms of discrimination are absent or underfunded. Programs to help rural students learn about the world's diversity would result in a far more capable and nimble network of graduates and alumni.

One important way to diffuse these intellectual abilities is to reimagine the aspects of the core curriculum focusing on diversity, inclusion, and global learning and to require them university-wide, rather than just in the College of Arts & Sciences, as is our current practice. Combined with a newly-designed curriculum, academic units and institutes could launch initiatives, research clusters and laboratories, and can work with the nonprofit sector to shape more democratic, diverse communities. Newly-built nonprofit organizations could be sources of internship opportunities for students, jobs for graduates, and community hubs for engaged citizens.

Correspondence to Presidential Priorities

Quality of Democracy and Equality speaks most directly to President Seidel's emphasis on *diversity and inclusion*: this theme requires research and content knowledge about international relations; about race, class, and gender; about the history of how inequalities have shaped political, civic, and economic institutions. A democratic commitment to access to knowledge must also be *interdisciplinary*, drawing from a range of humanities and social science disciplines, as well as sciences with an attention to human dynamics and impacts on human life.

We have opportunities to talk about bringing people together in dialogue in person and online, given how we have adapted to the COVID pandemic. We can marshal resources from the *digital* humanities, data science, computer programming, drawing, once again, on whole-brain thinking. Developing smart systems for institutional and social change can improve the range of our activities, from research and teaching to service and outreach. An attention to the quality of democracy and equality, diversity and inclusion are central to efforts for generating *economic and workforce development*.

