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Working Group Report I: Environmental Scan

Dr. Chermak Leading The Environmental Scan Working Group Discussion
Members: Mary Jo Daniel, Barbara McCrady, Patricia Henning (Co-Chair), Janie Chermak (Chair), Tobias Fischer, Lauren Medrano, Andrew Shreve, Gabriel Sanchez
EXECUTIVE SUMMARY

The Environmental Research Scan Working Group was formed to: (a) provide relevant background information on state demographics, current and future trends in higher education research funding, economics, and budgetary matters; (b) identify current and future trends in research and technology; and (c) identify opportunities and challenges for the University of New Mexico (UNM).

Key Factors: New Mexico
- NM faces challenges in education, income, and economic growth.
- NM is one of the few minority-majority states.
- NM economy relies heavily on natural resource extraction and governmental funding.
- The arts, cultural, and tourism industries are also key drivers of NM’s economy.

General Findings: Roundtables and Interviews
- UNM’s research is viewed as “strong” but not well-known to those outside the university.
- There is a perceived lack of adequate infrastructure support for the research mission and insufficient support for interdisciplinary research.
- There is a perceived lack of integration into the research community of some research areas outside of traditional science, technology, engineering, and mathematics (STEM) disciplines.

Federal Funding
Federal agency spending on Research and Development (R&D) steadily increased from the 1970’s through the mid-2000’s in constant dollars. Since the recession of 2008/2009, R&D spending has declined, but remains above 1990 levels. It is important to note the steady growth of R&D spending at the National Institutes of Health (NIH) and the Department of Health and Human Services (HHS) and the sustained R&D spending of the Department of Defense (DOD). The National Science Foundation (NSF) has continually been a small portion of the total R&D budget. Federal R&D funding priorities are identified in the agencies’ strategic plans.

Industry Funding
Industry plays a substantial role in basic research in the US. Although federal funding has increased over the period, the largest changes have been in industrial funding for research. It should, however, be noted that research funding from industry is more focused on applied than on basic research. Industry-funded research focuses on development in specific areas that are advantageous to industry.

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1The working group members are Janie Chermak, Mary Jo Daniel, Tobias Fisher, Trish Henning, Barbara McCrady, Gabriel Sanchez, and Andrew Shreve
Foundation Funding
Although private foundation funding currently is relatively small in NM compared to the nation, such funding makes an important contribution to the arts and education.

Peer Institutions
A scan of peer institutions suggests that although specifics vary, there are overarching goals related to increasing research capacity. These include building strategic partnerships and investment in facilities and human capital.

UNM Main Campus Funding
UNM external research expenditures have fluctuated between $100 and $130 million over the last decade.

Opportunities
- The unique demographics, environment, and social and economic factors of NM can be used to build a research agenda that will both move the state forward and provide generalizable knowledge of relevance to the nation.
- Develop and strengthen collaborations across disciplines and with the Health Sciences Center to increase inter- and trans-disciplinary research.
- The funded research landscape is changing. The traditional funding sources may not be the dominant funding sources of the future. The university needs to diversify its funding portfolio.
INTRODUCTION

The Office of the Vice President for Research has been given the task of creating a strategic plan that will focus specifically on research. The plan, once developed, will become the roadmap for future research at the University of New Mexico. It is imperative that we look forward, to the world ahead of us, to build UNM as a world-class research university dedicated to research, scholarship, and creative works.

As a part of this endeavor, a working group was formed in Summer 2016 and tasked with the development of an Environmental Scan of the external research environment. This report is the product of the working group.

Charge to the Working Group
The Environmental Scan Working Group was charged with gathering and synthesizing information about the current status and future trends in research funding and priorities as well as demographics and economic information that could inform the other groups developing the overall research strategic plan. The scan was to include input from knowledgeable members of the UNM community and external subject matter experts as well as relevant public reports and websites. See Appendix A for the full charge to the working group.

Process
The Working Group identified key stakeholder groups and scheduled “roundtable” discussions of different focus areas. The group developed an interview protocol (Appendix C) to guide roundtable discussions and one-on-one interviews; the protocol was modified as appropriate to the group or person interviewed. In addition, the working group reviewed funding agency and foundation websites to summarize trends and priorities and considered other institutions’ research strategic plans for guidance in developing a plan for UNM. Finally, the group determined that placing UNM’s research within the context of our state environment, that is a “state-of-the-state” was important for developing a useful research strategic plan for NM’s flagship university.
NEW MEXICO CONTEXT

New Mexico (NM) is diverse in its citizenry as well as in its natural resources and beauty. It is, however, a state that has a relatively undiversified economic base. NM has among the highest percentage contributions of federal dollars to the Gross State Product (GSP) and state government revenues rely largely on the extractive industries (e.g., oil, gas). This results in a state that is among the poorest performers in the nation in terms of economic growth, unemployment, health outcomes, and educational attainment. We discuss the demographics, the natural environment, and the economic conditions of the state in the following sections.

Demographic Profile

From the late 1990’s through the end of the first decade of the 2000’s, NM was one of the fastest growing states in terms of population. Our 2010 population was 2,059,180—a 13.2% increase from the 2000 census. This made NM one of the 15 fastest growing states in the nation.2 Since 2010, however, the rate of growth has decreased. The July 2015 census estimate of 2,085,109 is a mere 1.3% increase since 2010.3 This compares to a 4.1% national average over the same time period. This growth is uneven across the state, with many rural counties losing population while those along the Rio Grande continuing to grow (but at uneven rates).

The US Census4 reports Hispanics or Latinos—the terms are used interchangeably here—currently make up 48% of NM’s population, compared to 16% for the nation. This is the largest Hispanic percentage in any state in the nation. The Census also reports residents of Native American origin comprise slightly more than 10%, compared to 1.2% for the nation. Combining NM’s Hispanic population with its Native American community and other minority communities that are smaller in size, including vibrant Asian American (1.4%) and African American (2.1%) communities, makes NM one of the few minority-majority states in the United States.5

According to the 2010 Census, the median age of New Mexicans is 36.9, which is comparable to the median age across of the United States of 37.1. For NM Hispanics it

5 The Asian American and African American populations are substantially smaller than the national averages of 5.6% and African American of 12.6%.
is 31.1 years, while for New Mexican non-Hispanic whites, it is 48.2 years. The Native American and African American populations are even younger than NM’s Hispanic population. Given that all of these communities of color are more than ten years younger than whites in median age ensures that the state will become increasingly minority-majority over time.

NM income is among the lowest in the U.S. While the median household income for 2015 was slightly over $45,000 and the mean household income was over $65,000, the percentage of households in the lower income ranges is substantial, as shown in figure 1. Over 16% of households earned less than $15,000 in 2015.

![NEW MEXICO INCOME DISTRIBUTION](image)

In 2015 NM’s average personal income of $36,284 was approximately 81% of the national average. This places NM 44th of 51 in the U.S. (including DC). An increasing population with low personal income is seen as a continued challenge for the state.

NM ranked 50th of 51 (including the District of Columbia) in terms of poverty (Center for American Progress [CAP]). The state rate of 21.8% is substantially above the 14.8% national rate. NM ranked last in 2014 in childhood poverty with 29.1% of all children

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under 18 living in poverty (US Census Bureau), which is several points higher than the U.S. average of 22%. There is substantial variation in the childhood poverty rate, with 39% of NM Native American and 33% of NM Hispanic children living in poverty, compared to 14% of NM non-Hispanic white children. These rates are higher in all groups compared to national averages, where 21% of all children, 31% of Hispanic children, 34% of Native American children, and 12% of non-Hispanic white children live in poverty.\(^9\)

Rural school districts have student poverty rates as high as 90%. NM ranks last in the nation in child-health outcomes,\(^10\) and last in the teen pregnancy rate with 43.3 births per 1,000 women, compared to the national average of 26.5 (CAP 2015). Hispanics have the highest teen-pregnancy rates compared to all other groups in the state. NM’s African American, Native American and Hispanic communities have some of the highest infant mortality rates in the nation, compared to non-Hispanic whites and Asians in the state, who have much lower rates.\(^11\) **NM’s demographic profile poses challenges for state public health and health policy, but also suggests opportunities for enhanced research to address these outcomes.**

Specific to education, NM ranks last in high school graduation rate.\(^12\) NM’s 2015 graduation rate was 68.6% compared to the national average of 81%. There are variations across groups – 73% of NM non-Hispanic white young people complete high school, compared to only 67% of NM Hispanic and 64% of NM Native American young people.\(^13\)

### The State Lands and Resources

NM is the 5\(^{th}\) largest state in the US, consisting of 121,365 square miles, or 77.7 million acres. Its varied physical landscape of broken mesas, wide deserts, heavily forested mountain wildernesses, and high, bare peaks provides a variety of terrains and associated **ecosystems that can be highly vulnerable to impacts of climate change.** Water is a precious resource in this semi-arid land; the Rio Grande and other

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\(^13\) Graduation Rates 2015, New Mexico Public Education Department. Accessed November 1, 2016 at http://ped.state.nm.us/ped/Graduation_data.html
river systems provide essential water for municipal, agricultural and industrial use, as well as critical riparian habitat. Several mountain ranges provide watersheds for much of the state and year-round snow pack above the timberline exist in every quadrant of the state. Water rights are complex and the basis of years of litigation. The eastern third of the state is covered by the Great Plains, accounting for the largest percentage of the state’s topography. Water is rare in these regions, and the limited rainfall is subject to rapid evaporation.

Almost 35% of the land is federally owned. Bureau of Land Management lands accounts for almost 50% of the federal holdings; 45% are held by the U.S. Forest Service; and 12% by the Department of Defense. In addition, the State of NM owns about 11% of the total land mass and the 19 pueblos and three non-pueblo tribes own about 10% of the land.

NM has abundant natural resources and the extractive industries have been an important economic driver in the state for at least the last 100 years. In 2014, according to the US Energy Information Administration (EIA) NM ranked 6th in the U.S. in the production of oil (123 million barrels in 2014), which accounted for about 4.5% of total U.S. production. NM ranked 7th in natural gas production (1.22 trillion cubic feet in 2014), or about 4% of the U.S. total.14

The Permian Basin, located in the southeastern portion of the state is responsible for the majority of oil production in the state. Due in large part to the use of the combined technologies of horizontal drilling and hydraulic fracturing, state oil reserves increased more than 50 million barrels (more than 70%) between 2008 and 2013 (EIA), resulting in reserves of 1.2 billion barrels - ranking NM 5th in proven reserves. Although the state saw record oil production in 2015 (along with declining prices), the first six months of 2016 saw a decline in production of 465,000 barrels.

The San Juan Basin, located in northwest NM and southwest Colorado, is home to one of the largest conventional natural gas fields in the U.S. However, the field has been producing since the 1920’s and production has dropped substantially in the last several years. Although still in the top ten states in terms of proven reserves (7th), the focus on shale production in other regions of the U.S. has resulted in a decline in NM’s ranking of natural gas reserves. Further, due to increased production from other areas, and depressed prices, NM’s natural gas production has been declining since 2006.

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Despite the important contributions to the state economy, the extractive industries have produced a legacy of adverse environmental impacts that include radioactive mill tailings from uranium mining, a plume of methane gas over the Four Corners region, and the production of brackish water from oil and gas production.

**NM is also one of the leading regions in the United States for potential renewable energy resources**, possessing the country’s second greatest solar potential, eleventh greatest wind potential, and seventh greatest geothermal potential. In 2013, NM ranked 5th in the nation in utility-scale electricity generation from solar energy.\(^\text{15}\)

**The Economy**

A discussion of UNM’s strategic planning for university-wide research must take into consideration the budget issues facing NM that will undoubtedly impact research funding available from the state. This is of particular relevance for many research centers and colleges that rely heavily on the state for research and program funding. The NM legislature is facing a budget shortfall of close to $500 million for this budget cycle that began on July 1, 2016, with next year’s budget projected to require significant cuts as well. This budget reality is going to impact the amount of research contracts available to UNM researchers as well as funding requests from the state more generally.

NM’s 2014 economic activity, as measured by gross state product (GSP), was in excess of $92 billion. Of this, about 77% is attributed to the private sector and 23% to government - one of the highest percentages in the nation. NM’s mining activities account for the largest single portion of GSP from private enterprise at 18%, with oil and gas contributing 11%. Health activities (combining health care, social assistance, ambulatory health, and hospital facilities) contributed 16%, while real estate, rental and leasing also contributed 16%, and professional services contributed 11%.

Employment in the state comes from a variety of industries. Of note, the UNM Bureau of Business and Economic Research (BBER 2014) estimates the cultural economy accounts for almost 10% of total employment in the state and contributes about $5.6 billion per year to GSP, the cultural economy.

NM’s economic growth is among the lowest in the nation. The state was one of 13 that experienced negative growth in the first quarter of 2016 (BBER). Although NM’s decrease was only -0.6%, seasonally adjusted to annual rates, the sluggish economy is impacted by the state’s heavy reliance on mining and, especially, the production of oil.

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and natural gas. The forecast for future economic activity is closely tied to the oil and gas industry. Prices are not forecast to increase substantially through the end of 2017, as can be seen in the EIA price forecast in figure 2.\textsuperscript{16,17} Note, this forecast is not inconsistent with GSP forecasts for the next year for the state. For example, Elliott Eisenberg, an industry economist, suggests about 1% growth over the next year (Sinovic 2016).

![EIA Short-term Crude Oil Price Forecast for West Texas Intermediate Crude](image)

**Figure 2: EIA Short-term Crude Oil Price Forecast for West Texas Intermediate Crude**

State revenues rely on revenues from oil and natural gas. Morris (2016) evaluated the impact of fluctuating prices on state revenues in energy dependent states and made this observation (pg. 7):

“The swings in prices and quantities of fossil fuels produced in the United States, along with huge booms and busts in drilling activities, have made for volatile revenue streams…”

\textsuperscript{16} West Texas Intermediate (WTI) crude is the benchmark crude used for US oil prices.

\textsuperscript{17} The markets have tended to be volatile, responding to a variety of factors. For example, a decision made by OPEC (on Sept 28, 2016) to reduce production, provided some optimism to the market, with prices quickly increasing 5%. However, Goldman Sachs quickly announced that they would not alter their forecast through the end of 2016, projecting $43/barrel at the end of 2016 and $53 by the end of 2017 (Shaffer 2016). This suggests the move by OPEC may help stabilize prices at their current levels, but will not move them higher.
For NM, the state collects tax revenues from severance and federal and state royalties. These revenues account for about 40% of total tax revenues to the state of NM (Morris 2016). These revenues are from oil and natural gas produced both on private and public lands and so not only are the revenues subject to market forces, but they also depend on the political discretion of elected officials (both federal and state) concerning energy development on publically owned lands.

The state has also tried to expand economic development by attracting industries to the state. This includes the film industry, high tech, among others. The success of attracting industries to the state and the impact of those industries on the state has been varied.

FOCUS AREAS - ROUND TABLES AND INTERVIEWS

To develop a sense of the research environment from different perspectives, the committee convened a number of roundtables that included participants who were knowledgeable about and could address research, research opportunities, and UNM’s role from a variety of perspectives. Seven roundtables were held:

- UNM Institutional
- Federal
- State and Regional
- Technology
- Humanities, Arts, and Professional\(^\text{18}\)
- Education
- Diversity

Participants were invited based on their knowledge in the specific area (Appendix B provides a copy of the invitation). Due to time constraints, a single roundtable was held for each focus area and unfortunately, not all invitees were able to attend their scheduled session. To provide the participants with the ability to speak candidly, they were assured that they would not be identified in this report. A total of 31 invited individuals participated in the roundtable discussions.

The working group developed a set of basic questions, which were then modified for each roundtable as appropriate. Not all individuals answered all questions, but each participant contributed to the overall narrative. Two working group members attended each roundtable; one led the discussion and the other took notes. They collaborated in developing the discussion summaries.

\(^{18}\) Professional refers to traditional non-STEM areas, for example, business or law.
In addition to the roundtables, three individual interviews were conducted with L. Gilbert, PhD of van Scoyoc, T. Keller, NM State Auditor, and K. Richardson, PhD, State Field Representative for Senator Heinrich. An overall summary of these discussions is presented here; more detailed content of each roundtable and interview is presented in Appendix D.

Summary of Roundtables and Interviews
The roundtables provided a wide and nuanced view of strengths and weaknesses in research at UNM, and were particularly helpful in generating a broad vision of ways to strengthen and broaden the research mission of the University. In general, the roundtables were weighted towards individuals with a focus on traditional STEM disciplines, and therefore, had a more limited focus on social and behavioral sciences or issues related to challenges to the human condition in areas such as health and illness, economic disadvantage, and living conditions.

Across groups, participants generally viewed research as UNM as “strong,” and noted a number of content areas of particular strength. In the STEM disciplines, UNM was seen as strong in astrophysics, big data, cybersecurity, energy, informatics, materials, neuroscience, photonics, and water. UNM research also was seen as particularly strong in addictions, anthropology, bilingual and Native American education, improving educational outcomes for diverse populations, populations of the Southwest, and research on social and economic well-being of diverse populations. Different groups had different perceptions of the value of Innovate ABQ; some saw it as providing important opportunities for moving research to commercialization, which would contribute to improving the economy in the state. Others were more skeptical about its value.

Participants also were fairly consistent in identifying areas of relative weakness in research at UNM. First, research was seen as insufficiently connected to the teaching mission of the university, in that there were limited opportunities for undergraduates to conduct research. Research at UNM also was seen as disconnected from students in the primary and secondary education system and their families, and from the needs of the state in terms of NM workforce needs. Even where research at UNM may have substantial relevance to the needs of the state, participants indicated that this research is not well-known to the community, legislators, and individuals in state government.

A second important area of weakness revolved around research vision, planning, and infrastructure support. UNM was seen as lacking adequate support for interdisciplinary teams or large-scale research initiatives. Participants were critical of the historical lack of long-term planning for research at an institutional level. The role of the VPR and OVPR in providing research leadership has been insufficiently articulated by university
leadership, the office was seen as under-resourced, and basic resources for researchers were seen as insufficient. The quality of some research facilities was viewed as an impediment to conducting research and to recruiting and retaining top faculty. Participants also noted the lack of an effective and efficient infrastructure to support proposal development, submission, and grants management.

A final set of weaknesses noted by participants focused largely on challenges to faculty in certain disciplines. Compared to other Research I institutions, high teaching demands in certain colleges and departments make it challenging for their faculty to devote sufficient time to their research. Additionally, unique hurdles were described for faculty in the humanities, arts, and professions, such as the small size of monetary grants, the lack of showcasing/reporting research and scholarship in these disciplines, and a general feeling of being disconnected from OVPR.

Participants in the roundtables also were enormously helpful in articulating a vision for a stronger and expanded research mission within the University. There was a general recognition that UNM cannot rely solely on Federal funding for research; participants emphasized the importance of developing other funding opportunities, such as through partnerships with the private sector and with private foundations with targeted interests in the unique challenges faced by NM. UNM was encouraged to look at models for industrial/academic/government partnerships, and, because the federal funding cycles are far slower than required to address many quickly emerging research issues and technologies, to plan for partnerships that would allow for rapid response to such emerging issues. Fostering and building more interdisciplinary or trans-disciplinary research teams was seen as key, including ones that span science, engineering, technology, arts, and humanities. The Office of the Vice President of Research (OVPR) and the University were encouraged to create opportunities for interactions across disparate disciplines, and create and support interdisciplinary research centers. The value of building collaborations across research universities in NM, with regional campuses and community colleges, with the sovereign Native American nations of NM, and with selected international partners, also was suggested.

Participants also emphasized the importance of building upon strengths unique to NM and to UNM. One idea was to capitalize on the diverse demographics of our student population by doing more to prepare students for research careers. Such training, particularly for students from under-represented minority groups, would be appealing to industry. A second idea was to define a specific "niche" for research at UNM by emphasizing place-based research that addresses problems of relevance to NM that may also be of national/global import. Examples cited included using NM as a lab for environmental studies related to water and other environmental issues, testing of
innovative educational strategies in diverse populations, and research on rural as well as uniquely Southwestern populations. Accompanying this greater definition of research niches, the value of having the OVPR effectively communicate to federal agencies and policy-makers the value of this kind of research was noted. xo solutions for problems faced in NM and could be deliberate in educating the public, legislators, and state government about these efforts.

A number of suggestions and opportunities were provided in more technical areas. Participants thought that UNM should continue to foster and expand partnerships with the National Labs, and also focus more on entrepreneurship that moves basic research to commercialization. In terms of specific content areas for research, participants suggested a multi-pronged approach to energy, and, given the impact of technology on work force needs, increasing research in areas such as human-technology interactions, data analysis, and computational sciences. To be successful in STEM research in particular, participants emphasized the need to invest in the research infrastructure, labs, facilities, and equipment.

Suggestions also were provided that recognized the diversity of research and faculty at UNM. For example, although outside the purview of the VPR, a re-examination of tenure and promotion criteria was suggested that would better encompass and define scholarly accomplishments in the arts, humanities, and professions. Also suggested was an expansion of hiring and promotion criteria to consider diversity-related skill sets, experiences, and accomplishments in evaluating candidates for faculty positions.

Finally, participants had suggestions related to research infrastructure and planning, emphasizing the importance of a forward-looking vision for research, effective mechanisms to collaborate across the main and health sciences campuses, an effective infrastructure to support research, adequate funding for the OVPR, and ensuring upper-level executives within the university, as well as the Regents, are knowledgeable about the needs and key role of research within UNM. All of these suggestions were seen as essential to successfully advance the research mission of the University.
OVERVIEW OF RESEARCH OPPORTUNITIES

A major consideration of research opportunities for UNM must include an assessment of current funding sources. In the following sections we provide an overview of the current research outlook and priorities of federal agencies, foundations, and industry.

Federal Funding Overview
Federal spending on Agency R&D increased steadily from the 1970’s through the mid-2000’s. Since the recession of 2008/2009, R&D spending has declined, but remains above 1990 levels, as can be seen in figure 3. The AAAS noted, in their assessment of the President’s budget, that the December FY16 omnibus spending bill allowed continued recovery from the sequestration levels for most science agencies. Striking in the trends is the steady growth of R&D spending at the National Institute of Health (NIH) and the Department of Health and Human Services (HHS), in general, and the sustained R&D spending of the Department of Defense (DOD). The National Science Foundation (NSF), which has been the primary federal supporter for UNM Main Campus researchers, has continually been a small portion of the total federal R&D budget. Federal R&D accounts for approximately 3.5% of the total federal budget and slightly more than 11% of discretionary spending. Although large, 11% is a substantial decline from the 1960’s when R&D accounted for as much as 17% of discretionary spending.

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20 Note the budgets are presented inconstant dollars with inflation removed.
21 Legend: Department of Defense (DOD); National Aeronautics and Space Administration (NASA); Department of Energy (DOE); Health and Human Services (HHS); National Institutes of Health (NIH); National Science Foundation (NSF); US Department of Agriculture (USDA); Interior; Department of Transportation (DOT); Environmental Protection Agency (EPA); Department of Commerce (DOC); Department of Homeland Security (DHS); Veteran’s Administration (VA); and Other.
Figure 3: HISTORIC FEDERAL R&D SPENDING (in thousands of millions of constant dollars)

Figure 4 provides the 2016 Federal R&D budget. To a large extent, it is these R&D dollars that traditionally have provided the bulk of research funding to academic institutions.

In his January 2016 State of the Union Address, President Obama’s new research and development budget priorities focused broadly on jobs and technical innovation; energy and low-carbon energy; health; climate and the environment; and infrastructure. More recently (Oct 2016), President Obama hosted the White House Frontiers Conference,
which focused on innovation in a number of cutting-edge areas, including health care and precision medicine; smart communities; data science; clean energy; and space exploration to Mars.

Specific to jobs and technical innovation, R&D expenditures for advanced manufacturing were proposed with initiatives moving forward in the NSF, the DOE, as well as advanced computing DOE initiatives. The R&D emphasis on low-carbon energy focused on renewables and improved efficiency, mainly through DOE initiatives, as well as through NSF funding for clean energy technology.

Climate and the environment initiatives focus on climate and resilience research, with the U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) taking the lead in new funding. This research is also funded to a lesser extent by NSF directorates and DOE. Finally, infrastructure R&D increases focused on next-generation technologies in aviation and rail, as well as intelligent transportation systems. The Obama Administration’s FY17 budget request includes about $154 billion for federal research and development (R&D) initiatives (included in chart 1). This is a 4% increase over FY16 funding levels approved in the December omnibus spending bill.

Breaking the FY17 request into Defense and Non-defense spending, Defense R&D spending would increase 3.7%, while non-defense would decline 1.5%. Although the President’s requests have been put forward, at the time of this writing, Congress is still in the process of agreeing on R&D appropriations. Consequently, budget information provided in the following sections is subject to change, depending on Congress.  

Although NSF’s research budget is modest compared to that of other agencies, the NSF is one of the main funders of academic research, providing about $5.5 billion in research funding to universities, which is about 78% of the total NSF budget. On a broader scale, NSF recently published its six big research ideas, which are:

- Harnessing Data for 21st Century Science and Engineering;
- Shaping the New Human – Technology Frontier;
- Understanding the Rules of Life: Predicting Phenotype;
- The Quantum Leap: Leading the Next Quantum Revolution;

22 Figure 3 includes the R&D request from the President, which is about $150 billion. The other $4 billion is proposed mandatory spending (AAAS 2016)
• Navigating the New Arctic; and
• Windows on the Universe: The Era of Multi-messenger Astrophysics.

NIH and HHS also have articulated a set of major goals and foci for research, including:
• Generate data to address societal issues, such as disaster response, poverty, prejudice, health disparities, mental and physical illness
• Increase focus on human diversity
• Increase applications of basic scientific methods and tools to applied problems
• Expand/change how science is conducted

A summary of the missions, goals, and objectives of the majority of these individual agencies is presented in the Appendix F.

Industrial Overview
Industry plays a substantial role in basic research in the US as is indicated in figure 5, which shows all research funding expenditures from 1980 through 2012 (in 2015 constant dollars), broken out by funding source. NSF defines “all research” as the “systematic study directed towards fuller scientific knowledge or understanding of the subject studied.” Federal funding has increased over the period, but the largest changes have been in industrial funding. Figure 6 includes only “basic” research funding defined by the NSF as having an objective to “gain more complete knowledge or understanding of the fundamental aspects of phenomena and of observable facts, without specific applications toward processes or products in mind.”

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25 Data from SSTI (May 28, 2015) accessed on 10/10/2016 from http://ssti.org/blog/changing-nature-us-basic-research-trends-funding-sources, which is compiled from the NSF.

26 “Other” includes non-profit and other governmental.
These two charts suggest that research funding from industry is more focused on applied research than on basic research. Industry-funded research focused on development appears centered in specific areas that are advantageous to industry and can change rapidly. For example, a 2012 news article, utilizing the 2012 National
Science Board’s 2012 Report on Science and Engineering Indicators (SEI), reported that in 2008, 70% of industry-funded research in the US was from the manufacturing industry. The National Science Board’s 2016 Science and Engineering Indicators report found that manufacturing now accounts for 84% of total industry-funded research.  

Figure 7 provides the breakout for 2013 based on the North American Industrial Classification (NAIC) system’s codes.  

Another recent news article reported that almost 75% of all clinical trials are funded by industry. This suggests universities that have specializations matching industry needs are better positioned to receive industry funding and that not all universities will be successful. This is substantiated by a number of universities that are trying to define their interactions with industry. For example, Harvard University has tripled its corporate research funding from 2006 to 2013 and at Boston University, a discussion to determine goals, mission, university structure and staffing to increase collaboration with industry is a current focus (Jahnke 2015).

Foundation Overview
Private foundations are another potential source of research funding. As can be seen from chart 3 above (where foundations are included in “Other”), this is a small portion of

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28 The NAIC codes are broad in nature and may obfuscate specific research areas, as different activities are parsed between different codes.

overall research funding in the U.S. The Foundation Center reported that there were over 86,000 foundations in their database in 2014. About 92% of these were independent foundations, with corporate, operating, and community foundations accounting for the other 8%. Specific to New Mexico, the Center reported a total of 275 foundations in the state. In 2012, these foundations funded 478 grants across the state, totaling more than $53 million (while this is less than 1% of the US total grant funding by foundations, New Mexico is a relatively small state both in terms of population and in terms of wealth). The distribution of these funds is provided in figure 8. The largest funding areas by foundations are education and arts and culture.

![Figure 8: 2012 FOUNDATION FUNDING BY AREA IN NEW MEXICO (in millions of $'s)](image)

There are high profile foundations operating in New Mexico (e.g., the Robert Wood Johnson Foundation, W.K. Kellogg, Ford, Russell Sage) as well as many small local foundations. A commonality of these, regardless of size, appears to be a specific focus. More detail for some foundations is provided in Appendix G.

**OTHER INSTITUTIONS VISIONS AND STRATEGIES**

Although UNM’s Research Strategic Plan is being developed to recognize UNM’s unique strengths and situation, we do want to be cognizant of other institutions’ research visions and strategies. To make comparisons, we considered peer institutions, which have recently done a research strategic planning exercise. There are four such institutions: **New Mexico State University – Main Campus**, **University of Tennessee**, **University of Texas at El Paso**, and **University of Oklahoma – Norman Campus**. Although specifics vary across institutions, there are overarching goals related to increasing research capacity. These include building strategic partnerships, and
investment in facilities and human capital. The plans for each institution are summarized in the Appendix H.

The partnerships called out depend on the location and strengths of the individual institution, though collaborations with national labs and industries are commonly called out as they support existing strengths, and may be a fruitful direction for UNM as well. Targeted investment in areas of research strength is recommended, with emphasis on supporting interdisciplinary work. In some cases, an increased faculty size is recommended, taking research directions into account in hires, including hiring to create research focus clusters. Also notable is attention paid to supporting student mentoring and research via internships and other work experience, assessment of graduation times, and maintaining favorable student/faculty ratios.

**ANALYSIS OF AGGREGATE FUNDING TRENDS AT UNM**

While external funding would be a preferred way to report on the preferred trend to consider for the report, changes in reporting mechanisms at UNM, coupled with the extraordinary funding from the ARRA “stimulus” funding in 2010, provides an uneven snapshot. Consequently, we provide annual external research expenditures in figure 9. While research expenditures have declined since 2012, there has been a slight increase in expenditures since 2014.

![Research Expenditures (w/out Financial Aid)](image)

*Figure 9: ANNUAL UNM RESEARCH AWARDS*

The primary sponsors of external funding at UNM are federal and state agencies, foundations, and industry, with federal agencies providing the majority of funding. Figure
10 shows the distribution of sponsored awards for FY 16 at UNM main campus and branches.  

<table>
<thead>
<tr>
<th>Sponsor Type</th>
<th>Total</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>$81,579,849</td>
<td>58%</td>
</tr>
<tr>
<td>In-State Government</td>
<td>23,865,880</td>
<td>17%</td>
</tr>
<tr>
<td>College or University*</td>
<td>9,474,173</td>
<td>7%</td>
</tr>
<tr>
<td>Foundation</td>
<td>9,187,061</td>
<td>6%</td>
</tr>
<tr>
<td>Industry</td>
<td>8,768,597</td>
<td>6%</td>
</tr>
<tr>
<td>Other Non-Profit Org</td>
<td>4,478,199</td>
<td>3%</td>
</tr>
<tr>
<td>Local Government</td>
<td>1,920,812</td>
<td>1%</td>
</tr>
<tr>
<td>Foreign</td>
<td>1,663,732</td>
<td>1%</td>
</tr>
<tr>
<td>National Laboratory</td>
<td>395,058</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Out-of-State Govt.</td>
<td>158,467</td>
<td>&lt;1%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>141,491,829</td>
<td>100%</td>
</tr>
</tbody>
</table>

* It should be noted that Awards included in non-federal categories (e.g., In-State Government, College or University, Industry and National Laboratory awards) may include significant Federal funds. Most of the awards from other colleges and universities are sub-awards for which the sources of funding are federal agencies.

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30 Figure 10 is based on data in the UNM Cayuse system. No distinction is made between funds for research (knowledge generation) and funds for training or other non-research purposes. These data do not include fellowships or other awards made to individual faculty, which are not counted as sponsored research.

31 Due to rounding, the numbers may not equal 100%.
<table>
<thead>
<tr>
<th>Sponsor</th>
<th>Award(s) Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Science Foundation</td>
<td>$40,670,206</td>
</tr>
<tr>
<td>New Mexico Children Youth and Families Department</td>
<td>$10,619,833</td>
</tr>
<tr>
<td>Department of Education</td>
<td>$7,644,097</td>
</tr>
<tr>
<td>Kellogg (W K) Foundation</td>
<td>$6,222,593</td>
</tr>
<tr>
<td>Air Force Office of Scientific Research</td>
<td>$5,748,018</td>
</tr>
<tr>
<td>National Institutes of Health/NIH**</td>
<td>$4,003,976</td>
</tr>
<tr>
<td>NM Public Education Department</td>
<td>$2,408,519</td>
</tr>
<tr>
<td>New Mexico Higher Education Department</td>
<td>$2,384,099</td>
</tr>
<tr>
<td>New Mexico Department of Transportation</td>
<td>$2,243,319</td>
</tr>
<tr>
<td>Department of Energy</td>
<td>$2,097,410</td>
</tr>
<tr>
<td>Office of Naval Research</td>
<td>$2,045,958</td>
</tr>
<tr>
<td>National Institute on Alcohol Abuse and Alcoholism/NIH**</td>
<td>$1,908,908</td>
</tr>
<tr>
<td>Corporation for Public Broadcasting</td>
<td>$1,701,689</td>
</tr>
<tr>
<td>National Aeronautics &amp; Space Administration</td>
<td>$1,678,769</td>
</tr>
<tr>
<td>Sandia National Laboratories</td>
<td>$1,466,734</td>
</tr>
<tr>
<td>National Institute of General Medical Sciences/NIH**</td>
<td>$1,408,493</td>
</tr>
<tr>
<td>University of North Carolina-Chapel Hill</td>
<td>$1,400,256</td>
</tr>
<tr>
<td>Air Force Research Laboratory</td>
<td>$1,383,607</td>
</tr>
<tr>
<td>City of Albuquerque</td>
<td>$1,238,904</td>
</tr>
<tr>
<td>Defense Threat Reduction Agency</td>
<td>$1,224,148</td>
</tr>
<tr>
<td>New Mexico Environment Department</td>
<td>$1,114,932</td>
</tr>
<tr>
<td>New Mexico Game and Fish Department</td>
<td>$1,032,923</td>
</tr>
<tr>
<td>Los Alamos National Laboratory</td>
<td>$857,514</td>
</tr>
<tr>
<td>State of New Mexico</td>
<td>$839,455</td>
</tr>
<tr>
<td>National Park Service (CP-CESU)</td>
<td>$805,786</td>
</tr>
</tbody>
</table>

**Figure 11: SPONSORS WITH THE 25 HIGHEST AWARD AMOUNTS AT UNM MAIN CAMPUS FOR FY 16**

All NIH awards from all sources equal a combined $9,904,841.
SUMMARY: CHALLENGES AND OPPORTUNITIES

Research Challenges
The University of New Mexico faces many challenges in research. They are both internal and external. Externally, the university is competing for federal research dollars that declined during the 2008/2009, have rebounded somewhat, but are not forecast to increase greatly in the future. Including sub-awards from other universities, 2016 research funding at UNM is more than 60% funded by direct federal dollars (figure 11).

A discussion of UNM’s strategic planning for university wide research must take into consideration the budget issues facing New Mexico that will undoubtedly impact research funding available from the state. State government dollars account for 17% of the 2016 research funding. Future state budgets will likely be closely tied to oil and natural gas prices. Forecasts of future prices are highly variable and strongly depend on changes in either supply or demand in the market. The New Mexico legislature is facing a budget shortfall of close to $500 million for this budget cycle that began on July 1, 2016, with next year’s budget projected to require significant cuts as well. While most state higher education funding is not directed immediately towards the research endeavor, there is a strong overlap between the academic and research missions of a university. Instability in budgets impact academics and, in turn, research.

Further, declining state budgets are of particular relevance for many research centers and colleges that rely heavily and directly on the state for research and program funding. This budget reality is going to impact the amount of research contracts available to UNM researchers.

Federal research dollars are largely concentrated in defense and in health spending, which, will be a positive impact for some research areas at UNM. President Obama’s 2016 State of the Union laid out his research objectives. These are subject to change with the outcome of the recent Presidential election. And, as is often mentioned, research dollars are becoming politicize. While the President Elect’s policies may have short-term effects in some research areas, research strategies are longer-term endeavors and the challenge may be to navigate the short-term while focusing on the longer-term.

32 Funding for climate change research is the example that is often provided, (e.g., a AAAS discussion of the 2016 federal budget (available at http://www.aaas.org/news/modest-science-appropriations-few-surprises-so-far) states: “there isn’t an R&D funding area as divisive as climate research and other emissions-related programs on renewable energy and efficiency – not only between the parties, but between the House and the Senate as well.”
Specific to the university, as pointed out by many participants in our roundtables, the university should not depend solely upon federal research dollars, but rather should seek alternative funding. Further, participants identified a number of difficulties with seeking additional funding sources including a lack of recognition of UNM’s research capabilities among potential funders, lack of large New Mexico private funding sources, lack of adequate promotion of UNM research, and a lack of infrastructure that provides flexibility to react to a changing research landscape.

Industry and foundations as funding sources with greater potential were suggested by a number of roundtable participants. However, these are the sources that many other universities are now targeting. Jahnke (2015) reports that Matt Hourihan, Director of the AAAS R&D Budget and Policy Program, says the notion that these sponsors are “waiting in the wings” may be comforting, but AAAS hasn’t found this to be case. Quoting Hourihan as quoted in Jaenke “Industry contributions haven’t increased appreciably, and I’m not sure we have a clear enough picture on the philanthropic front yet.”

Within the university, a number of challenges also exist. There is an obvious disconnect between traditional views of research and those in the non-STEM humanities, arts, and professional (HAP) fields. Lack of understanding among various areas, as well as a lack of incorporation of HAP into integrated or interdisciplinary research may firmly plant the university in an outdated 20th century research mode.

Finally, although the university prides itself on support of interdisciplinary research across fields infrastructure to support such research is lacking.

Finally, changes in university administration also may be a challenge to the research mission of the university. Since the university was founded in 1889, there have been 21 presidents. Seven of these presidents have served since 1990, resulting in an average tenure of 3.7 years. The American Council on Education reported in their 2006 survey that the average tenure of a university or college president was 8.5 years. By 2011 the average declined to seven years. Regardless, UNM falls well below those averages. With the changes in presidents, there is often a change in focus, as well as a change in leadership at the academic and research levels. All of these changes can provide instability that presents challenges for research.

Research Opportunities
There are a number of potential research opportunities going forward for UNM. Certainly, the ability to continue to excel in traditional areas of strength is the foundation on which to build future success. However, there are additional opportunities that have emerged from this scan.
The unique demography of the state has been identified by many demographers, social scientists, and journalists as a model of what the United States will look like toward 2050. While high poverty rates, low educational attainment rates, and heterogeneity between urban and rural outcomes are challenges that impact many regions, UNM could take advantage of these challenges by becoming a leader in research and policy development aimed at changing these trends. This could provide an opportunity for UNM researchers to be leaders in these areas. In addition, a reduction in New Mexico’s poverty and income inequality could have a huge long-term impact on the state’s overall economic well-being, which could lead to higher college enrollments and a greater tax base, both positive for UNM’s prospect of acquiring greater funding from the state.

There are some areas of research that provide a model of how research at UNM can capitalize on the unique aspects of NM to develop interdisciplinary programs of research. For example, New Mexico’s natural resources and their exploitation, as well as the impacts on availability and the environment, have led to a group of researchers in the university with diverse backgrounds collaborating to focus on a wide variety of water issues. Many research initiatives promoted by various funders focus on complex problems of limited resources such as water, making these types of efforts potential nexuses for major funding. For example, DOE’s “Mission Innovation” is a new initiative focused on development of clean energy options for the nation; UNM is well poised to lead research in materials science, nuclear energy, electrical grid systems, as well as water resources in support of this goal. Development and promotion of interdisciplinary research on these types of complex problems provide a niche research focus that is a “case study” location. Further pushing the boundaries to combine STEM and non-STEM research could further advance cutting edge work.

An expansion of the UNM research-funding portfolio to other federal agencies, foundations, industry and state agencies would provide more resilient funding sources for the university. Finally, the search for a new president may provide an opportunity to bring research to the forefront as a university initiative.
REFERENCES


University of New Mexico Bureau of Business and Economic Research (2014). “Building on the Past, Facing the Future: Renewing the Creative Economy of New Mexico.” A report commissioned by the New Mexico Department of Cultural Affairs
Appendix A: Environmental Scan Working Group Membership

The working group is comprised of UNM faculty members who collectively have expertise across a wide range of research and scholarship activities at UNM. The committee members are:

Janie M. Chermak (committee chair)
Professor of Economics

Mary Jo Daniel
Director, Faculty Research Development Office
Research Associate Professor

Tobias Fischer
Professor of Earth and Planetary Science

Patricia Henning, PhD (committee co-chair)
Associate Vice President for Research
Professor of Physics and Astronomy

Barbara McCrady, PhD
Director, Center on Alcohol, Substance Abuse and Addictions (CASAA)
Distinguished Professor of Psychology

Gabriel Sanchez, PhD
Executive Director, RWJF Center for Health Policy
Director: Institute for Policy, Evaluation & Applied Research (IPEAR)
Professor of Political Science

Andrew Shreve, PhD
Director, Center for Biomedical Engineering
Professor of Chemical and Nuclear Engineering and Professor of Chemical and Biological Engineering
Appendix B: Committee Charge

- Identify sources to cite regarding relevant background, for example
  - current and future trends on demographics at the state level.
  - current and future trends in higher education as it relates to research.
  - current and future trends in economic and budgetary matters.
- Identify current and future trends research and technology.
- Identify opportunities and challenges for the University of New Mexico.
- The scan should be based on research and consultation with internal and external experts, and interviews with constituent groups, subject matter experts and other key stakeholders.
  - The Environmental Scan Working Group members should use resources, reports and other information provided by Van Scoyoc Associates, Inc., UNM’s Washington, D.C. Lobbying Firm and our sources such as AAAS, Am. Soc. Engineering Ed. (ASEE), etc.
  - Using the insights gained from each of these sources, the Environmental Scan Working Group members should analyze and document how those trends are likely to affect research faculty, staff, and students, research centers and programs, resources, facilities, and funding.
- Produce a draft report by early August 2016.
- Chair will present draft environmental scan to the Research Strategic Planning Committee.
- Revisions are incorporated based on input from the RSP Committee and a final report is produced by late August, 2016.
Appendix C: ROUNDTABLE INVITATION LETTER

Dear _______________.

One of this year’s major goals of the Office of the Vice President for Research at the University of New Mexico (UNM) is to create a strategic plan specifically focused on research opportunities and priorities. My objective is to have this strategic plan in place by early Spring of 2017. The results will be used to guide decisions about institutional investments, recruitment, and development of large-scale initiatives that will shape future research activities at UNM.

One important step in developing a research strategic plan is to produce an environmental scan. An environmental scan is the process by which an organization systematically surveys and interprets relevant data to identify external opportunities and threats. The environmental scan should be a careful consideration of the environment in which the UNM exists. The scan should focus on the pertinent issues UNM will face in the next five years.

You have been identified as an individual who has valuable information that could assist in developing an Environmental Scan. I hope that you will be able to meet with the Environmental Scan Working Group. Dr. Janie Chermak, a member of the Environmental Scan Working Group, or a staff person from the Office of the Vice President for Research will contact you in the near future to schedule time to talk.

Should you have any questions, please feel free to contact Dr. Ricardo Maestas, Special Assistant to the Vice President for Research, at 505.277.6128 or via email at rmaestas5@unm.edu.

Sincerely
Dr. Gabriel P. López,
Vice President for Research
Introduction

The Office of the Vice President for Research at UNM is in the process of developing a research strategic plan. Research typically refers to systematic and original investigations to generate, develop, and validate new knowledge or solutions to contemporary problems. Scholarship is described in the Handbook as the “critical and accurate synthesis and dissemination of knowledge, and creative works in literature, the arts, or professions”. One important step in developing a research strategic plan is to produce an environmental scan. An environmental scan is the systematic survey and interpretation of relevant data to identify external opportunities and threats. The environmental scan will be a careful consideration of the environment in which UNM exists. Your input is vital to this process, so I have some questions I’d like to ask you today.

Questions

1. What do you see as challenges to research and scholarship, from a Federal perspective?
2. How do you view current and future federal trends for research in higher education? What do you think are and will be the major research focus areas at the federal level?
3. In your view, where do you think the emphases of federal funding will be as related to university research?
4. In which areas of research and technology do you think the US has an advantage over competitor nations and how do you think New Mexico can contribute to maintaining that advantage?
5. In which areas or research and technology does the US lag behind competitor nations and how can New Mexico help close this gap?
6. Given that NSF has a current strong emphasis on supporting research in the areas of resilience to natural hazards, data intensive science and engineering, building up STEM education in particular with data and technology emphasis, to name a few, what opportunities do you see for New Mexico and UNM?
7. What opportunities do you think UNM can capitalize on for research at the federal level?
8. What unique challenges do you think UNM faces in acquiring federal research dollars?
9. What do you see as unique opportunities for UNM in acquiring Federal research dollars?
10. Can you share what you think the attitudes of your congressional colleagues are toward research funding?
11. What are your perceptions of the research UNM conducts and how it contributes to the nation’s needs?
12. What additional comments do you have for us?
13. Do you have any questions for me?

Thank you for your valuable time. I appreciate your input. The research strategic plan, when developed, will become the road map for research at the University of New Mexico over the next five years.
Appendix E: ROUNDTABLE SUMMARY

E.1 UNM Institutional
The UNM Institutional Roundtable was attended by three individuals with diverse experience at UNM in central administration, student affairs, and the advancement of research training opportunities for students.

Overall, the group thought that research at UNM is stronger than might be readily apparent. The group emphasized the importance of building on our strengths through a focus on student demographics and place-based research. Perceived strengths included the diversity of research at UNM, and strengths in specific areas such as materials, informatics, anthropology, research focused on populations of the Southwest, addictions, and big data. Perceived weaknesses and challenges to research included the limited opportunities for undergraduates to conduct research, the insufficient outreach to primary and secondary education students and families to educate them about research, the lack of clarity in the articulated role of the VPR and OVPR in leadership for research, the scarcity of resources in terms of fiscal support to the OVPR, and often subpar research facilities.

To strengthen research at UNM, the group noted several opportunities, including expansion of partnerships with the national laboratories (e.g., through joint professorships), community-engaged scholarship, building research talent among our diverse undergraduate population, and building on entrepreneurial opportunities. The group viewed the research and educational missions of the University as synergistic, in that more research opportunities could enhance student retention, and that developing research skills would make our diverse student population particularly appealing to funders, the national labs, and industry.

Finally, the group emphasized the need for partnerships – among units within the university, and with community colleges and regional campuses. The group also emphasized the importance of upper-level executives in the university understanding the needs of research and being aware of and committed to fostering and developing the research mission.

E.2 Federal
The UNM Roundtable to elicit Federal perspectives was attended by four individuals with experience largely in technical areas related to Federal research funding. Two participants were internal to UNM; two represented members of the New Mexico Congressional delegation. A standard set of questions was used to generate discussion; in general, all four individuals participated actively in the discussion.
A first major theme of the roundtable was the perceived future of Federal funding for research. Participants generally viewed Federal dollars for research as flat, or even shrinking in terms of real dollars. The group thought that this forecast suggested the importance of expanding potential avenues for funding, including: (a) partnerships with the private sector, (b) research and development initiatives, (c) Department of Defense funding; (d) private foundations with targeted interest in challenges faced by New Mexico, (e) partnerships within and across institutions to accomplish larger-scale research programs, and (f) making UNM’s unique resources better known to potential collaborators to foster research partnerships.

The group also shared perception of future Federal trends related to research, which included: (a) building research capacity among under-represented minority groups; (b) the importance of interdisciplinary/transdisciplinary research teams; (c) multipronged approaches to energy; and (d) potential increases in funding for NIH, although no one in the group had the expertise to articulate a vision of NIH priorities. They also noted changes in the US economy and workforce, noting that the US is a leader in most areas of R & D and is “vastly leading” in infrastructure, but that manufacturing jobs continue to move overseas, requiring that the US workforce have higher skill sets.

Participants noted key areas of strength in research at UNM, including photonics, cybersecurity, brain, big data, energy (including renewable energy), water, and astrophysics. They saw these as areas for which DOE and NSF funding would continue to be available. They also pointed to Innovate ABQ as a potential resource, particularly for research to practice initiatives.

Participants also emphasized several potential areas of opportunity and concepts to guide future directions in research, including (a) addressing problems that are not only New Mexican but also global problems (poverty and education were given as examples), (b) creating a close connection between the OVPR and the UNM Foundation to take advantage of the fact that many highly affluent individuals have homes in NM; (c) using UNM as a laboratory for environmental studies; (d) continuing and expanding relationships between UNM and the National Labs; (e) fostering relationships across international borders (particularly with Mexico), and with the sovereign Native American nations within New Mexico; and (f) capitalizing on diversity of student body, which could be attractive to industry and to potential industrial partnerships.

The group also articulated perceived weaknesses and barriers to greater research excellence. First, they described UNM as having a “small school attitude” about
research, with a lack of resources to support research and a lack of forward-looking planning for large initiatives at an institutional rather than an individual level. They thought it important that the OVPR take an increased role in being aware of agency priorities and engaging more with both the NM Congressional delegation and with agencies at program level office. Finally, they noted the lack of consistently effective and efficient infrastructure support for proposal development, submission, and management.

E.3 State and Regional

The State and Regional Roundtable was attended by five individuals who view NM and UNM’s research from their own experiences, roles, and expertise. Their knowledge of UNM and research at UNM is, in large part, based on these roles and interests.

While there was a general consensus that there is excellent research being done at UNM, the group felt that the research did not connect to policy within the state and an even stronger sense that UNM did not do a good job of “shining a light on the work that is being done.” There doesn’t seem to be general knowledge external to UNM about our excellence or how this contributes to important outcomes for the state or nation. The group noted that increasing awareness of how research is done at UNM will increase our external funding for this work.

A main area of concern is that there is a mismatch between the state’s needs and the university’s direction. Examples of where the university research mission might contribute included a university trained researcher pipeline to the state; university participation in state economic development; and engaging pre-college students in research paths. There was also a concern voiced that what is touted as research innovation appears to be more real estate ventures than research – Innovate ABQ was used as an example.

Finally, the participants agreed that research in the 21st century would be collaborative and innovate across fields. They provided a number of suggestions for moving UNM towards that goal including: embrace what UNM is and focus on problem-based research and NM specific research; commercialize more research; improve the ability with which UNM responds to changes; develop an office of corporate relations; and increase focus on non-federal research funding. The overall theme of this discussion was that UNM could be the hub for economic development through our research for the state and region if we prioritize our research mission to be more state and regionally focused.
E.4 Technology

Four participants contributed to the Technology Roundtable. The participants’ expertise was diverse and they provided a view of UNM research specific to technology, innovation and commercialization.

Nearly all jobs in manufacturing and support (service) sectors will be replaced by Artificial Intelligence (AI)/Robotics technologies, even extending to low-level supervisory roles, and possibly even too much higher level positions and many future jobs will be done remotely. There are very strong economic and other drivers for technology oriented research aiming toward increased productivity and efficiency. **Research in human-technology interactions, data analysis, computational sciences, and integration of science and technology with social sciences will be increasingly important.**

**UNM needs to build a community, an infrastructure, and a culture of research that lead to new interdisciplinary opportunities.** Topics such as human-technology interactions or sustainability are of great interest to multiple sponsors and are ripe for interdisciplinary collaborations involving technologists and social scientists. There is also a large role for integration of research and education, and better understanding and implementation of new educational strategies that also impact research activities. Strategies could include an enhanced role of centers for interdisciplinary research. UNM should develop areas of uniqueness, while also acknowledging the high risk/high impact nature of such initiatives. UNM has a solid competitive existing position in technology-oriented activities (including startup incubation). Some obvious factors include presence of nearby national labs, and the presence at UNM of strong materials oriented capabilities, energy focused research, fuel cells, batteries, medical research, etc. **There is an increasing mismatch between the cycle time of federal funding opportunities and the pace of technology innovation.** One should increasingly look for industrial and entrepreneurial interactions that are faster moving, while also acknowledging that matching such initiatives with the university’s educational goal may be hard and any match with industry will require a clear commercial goal.

Generally, there is no lack of innovation, but the US has often had a gap in commercialization of research resulting in many US-developed technologies being commercialized by non-US companies. On a more local scale, we are generally doing well at initiating new commercial ventures in NM, but often end up seeing them leave during development stages. Strong commercialization activity would also create greater visibility for the university in the international community. The Innovation Academy is an important initiative that balances commercialization with education and research activities.
Ideally, the three NM research universities would establish areas of collaborative interactions, helping to promote an environment where the entire state is moving forward together in areas of technology and economic development. Generally, it was seen as unlikely that New Mexico (the state) would be successful in competing with other states to bring in large corporate investments.

Investment is required to obtain and maintain first rate facilities and infrastructure (e.g., labs, computational capabilities) and to recruit/retain faculty, and these challenges extend beyond research into the area of providing quality education in technical areas. These resource challenges are exacerbated by a relative lack of large technically oriented companies in the region; a role that is partly, but not entirely, filled by the national labs. For student education, and for some research activities, increased opportunities for student internships and co-op assignments, as well as collaborative engagement of industry with faculty and student teams, play an essential role. Institutional planning and creative thinking is needed to develop new, flexible, collaborative lab space that will meet future research needs. Topics such as partnerships with national labs, industries and alternative financing options (non-bonded) could be considered.

In addition, there are likely important opportunities in research that build upon the demographic diversity of the UNM community. Our undergraduate and graduate students comprise a population that technical employers are interested in, and that interest may also lead to collaborative research opportunities with industry and national labs.

E.5 Humanities, Arts, and Professional
The Humanities, Arts and Professional () roundtable was attended by seven UNM faculty who represented a broad cross-section of the HAP community at UNM and a representative of the UNM Foundation.

The major consensus of the group was that there is a large difference in STEM research, which was described in terms of sponsored research, and HAP research, which is non-systematically sponsored, or “sponsored on the retail level.” The group also agreed that UNM research is of high quality and that researchers do excellent research with very few resources. In addition, there was an overall view that the contributions of research from HAP to the state are large and often overlooked. A main reason given was the difficulty of measuring the research and scholarship of HAP.

There was also a general consensus that HAP research faces unique hurdles. These include, but are not limited to: the relatively small monetary size of grants which take as
much time to write as a large grant, providing special challenges (exacerbated by low probability of success); lack of reporting HAP scholarship adequately minimizes the contributions; and a disconnect between the OVPR and HAP research and scholarship in terms of contributions, hurdles, and support needed.

A discussion of actions, directions, or efforts that would further enhance HAP scholarship included a number of suggestions for the institution: the creation of or support for regional study centers; a clear definition of what scholarship counts towards promotion and tenure; a center devoted to moving HAP research forward; and systematic honoring of all research accomplishments at UNM. In terms of research focus, they suggested embracing who we are and what NM is and emphasizing research in those areas that define us but can be translated elsewhere. There was a general consensus that the future direction for funded research would be interdisciplinary in nature, and HAP can play a significant part through partnerships as well as education of students, and that research will increasingly include community funding with a focus on outcomes and outreach - not outputs.

**E.6 Education**

The Education Roundtable was attended by three faculty members from the College of Education. The discussion focused on their perceptions of educational research at UNM, opportunities for improvement of institutional procedures and areas for future expansion of educational research.

UNM has strengths in bilingual and Native American education in addition to its general focus on improving educational outcomes for diverse populations of students and teachers.

UNM should strive to be perceived as a solution to the main problems/challenges facing the state and our communities. If UNM becomes this problem solver for the state, state funding could increase as well as private foundation funding, given the large interest among those potential funders in improving NM’s outcomes. To do this, the suggestion was to prioritize research that has the potential to directly address New Mexico’s challenges. UNM could showcase how NM is a laboratory for many national challenges given our demographics and high rural make-up, which would lead to greater state revenue and partnerships for more external funding. UNM must assess the value of a given research project to the state and, as needed, be flexible in applying its administrative rules and procedures so that the benefit to the state is given at least equal priority to short-term benefits to campus.
E.7 Diversity
The Diversity Roundtable was attended by five individual faculty members representing a diverse range of colleges/disciplines at UNM, experience conducting research at UNM, and racial and ethnic background.

There was a real sense of pride among the participants in the high caliber research that is done by UNM faculty, particularly given that participants feel as though researchers lack the resources available to faculty at other institutions. However, there was also consensus that UNM lacks the infrastructure resources and strategic focus in areas of specialization necessary to take the institution to the next level. Finally, multiple faculty noted that high teaching demands limit the time available to conduct high level research. Multiple participants also noted that while research centers on campus provide the focal point for focused interdisciplinary research, these centers lack the ability to sustain themselves when initial funds dry up.

One general theme that emerged was that UNM is among the national leaders in research focused on the social and economic well-being minority populations. There was also a suggestion to focus more strategically on the strong mentoring models in place for faculty and PhD students of color that can be used as national models. Multiple participants noted that if we can build on those and market this as areas of collective expertise at UNM this could generate outside funds and improve our overall “brand”. For example, it was noted that we do not have an “impact the state” focus to our mission statement for the university as other institutions do, and that by enhancing the profile of research focused on rural America we could increase outside funding in these areas. In short, most of the suggestions in this area were focused on enhancing the existing research profile specific to diversity to increase our national profile, and consequently our funding streams from sources such as Title-V funding.

This group had a number of good suggestions for how to better prepare UNM for the future trends in funded research. This included moving away from individual based research to team science, building centers or institutes around key areas of focus. It was also noted that “big data” is increasingly important but UNM may lack the infrastructure to allow faculty to pursue more of this work. There was also agreement that funders like NIH want to see research that identifies causal mechanisms and NM and our population could be a natural resource for us to look at social mechanisms for health outcomes. Finally, faculty noted that a few specific suggestions in our final open-ended question. This included revising the pictures in the VPR’s office to better reflect the diversity of research and faculty conducted at UNM, and ensuring that outside funders are not able to drive decisions made at UNM. It was also noted that a major goal from the strategic plan should include better structural
relationships with HSC, which is limiting collaboration and outside funding opportunities. It was also suggested that we should find a means to allow units that can only bring in small contracts and grants to do so without having to support F&A for the institution.

E.8 Individual Interviews
In addition to the roundtables summarized above, the committee also interviewed individuals. Included in this were representatives from Van Scoyoc, the lobbying group representing UNM in DC as well as elected and appointed state officials.

E.8.1 Van Scoyoc
The Environmental Scan Working Group conducted a phone interview with Dr. Leslee Gilbert of Van Scoyoc Associates, the Washington, DC-based lobbying firm with which UNM has contracted services. The conversation focused on research challenges and opportunities as well as federal priorities for STEM research.

Dr. Gilbert noted that, in general, federal budgets are largely flat and that research programs are becoming increasingly competitive. She recommended that UNM identify **niche research areas** to avoid competing unsuccessfully with bigger institutions for large programs and that a **focus on uniquely southwestern populations** would make us more competitive. Our history of working with National Laboratories is a strength we should build upon. Cancer and water resources are two areas she identified as areas in which UNM could be expected to have strong research programs.

In terms of planning for the future, Dr. Gilbert identified three types of priorities at the federal level: 1) national needs based on perceived crises (e.g., Zika virus); 2) long-term view of national needs (e.g., cybersecurity); and 3) agency-based “pushes” or priorities they identify in strategic documents. She pointed to NSF’s recently released “Big Ideas” as an indication of that agency’s funding priorities and stated that Congress continues to be very supportive of healthcare/disease research, especially through the NIH.

Finally, Dr. Gilbert emphasized the importance of UNM having mechanisms to communicate to federal agencies and policy-makers the importance of and need for research into regional issues.
E.8.2 Senate Field Representative
Dr. Katie Richardson, Field Representative for NM Senator Martin Heinrich, shared her perspectives from a federal level on UNM research in an interview with VPR Gabriel Lopez.

A challenge for UNM is to align its research to priorities identified by agencies; NSF has recently identified priorities whereas other agencies’ priorities have been more obvious. From her perspective, some agencies are easier to work with, depending on what committees the Senators sit on. Heinrich sits on the Senate Armed Services Committee (SASC) and is especially interested in related areas; Udall serves on the defense appropriations subcommittee. This leads to good alignment with AFRL for example, as well as our NNSA national laboratories. The majority of their budget flows through these two committees.

Richardson identified several major research focus areas at the federal level: a) NIH’s National Cancer Institute and the Biden moonshot for cancer (https://www.cancer.gov/research/key-initiatives/moonshot-cancer-initiative); b) cybersecurity and quantum information; c) autonomy (e.g. human technology interface as well as robotics), especially at AFRL; d) omics like genomics (Big Data) which is a strength at UNM; e) grid modernization, clean energy and storage at DOE; and f) nanotech and materials research which aligns well with our national labs’ expertise. Richardson noted fewer dollars are allocated for basic research and more to applied research which is worrisome. Universities are the last bastion where we do basic research well. If we don’t do something about this trend, soon we will be in bad shape (e.g. in 30 yrs.). Doubling the NSF budget has been proposed for many years, but has not been considered a “must have” in the budget. Basic research is an uphill battle.

Richardson suggested that the UNM plan must align with NSF goals and that UNM’s work with the DOE Regional Mission Innovation Center Initiative is excellent and could lead to future research funding. She acknowledged UNM has good relationships with labs and pointed to recent joint hires, COSMIAC and AML as examples. She also suggested that UNM could use more big programs, such as the DOD program Defense Innovation Unit Experiments (DIUEs: currently in Boston, Austin, silicon valley - https://www.dius.mil/ http://www.heinrich.senate.gov/press-releases/udall-heinrich-nm-is-ideal-location-to-expand-defense-innovation-hub1) and added that research funding for large universities could be coupled better with industry. In this context, she asked who would be the anchor tenant for Innovate ABQ? NMC work is being funded by wine and industry; this could be leveraged.
Senator Heinrich believes strongly that university research is how you move the economy down the road; this becomes more important in lean times for the State. Richardson stated that Senator Heinrich’s office stands ready to help when asked by UNM.

Richardson thinks there are opportunities in the area of cybersecurity. Also every big industry has cybersecurity needs. SNL, CREL (in front of the fence), UNM connection. LANL is partnering with Ernst & Young on cybersecurity issues. These are not the only interests: Materials, Optics, Directed Energy, and Space Vehicles. We are trying to build directed energy manufacturing presence in ABQ. But, not clear how UNM would connect.

Dr. Richardson expressed enthusiasm for the research strategic plan, noting that building excellence under one umbrella will allow UNM to pursue bigger opportunities, such as the DOE Mission Innovation or DOE Bioenergy center. These large initiatives need leaders who have relationships in DC and a track record of success. She recommended UNM hire into areas where there are federal opportunities for research funding.

Finally, Richardson noted that all of the research at UNM is excellent, including LAII, Native American Studies, Flamenco and she added that the entire state relies on BBER for unbiased information. BBER is important to state political relationships.

E.8.3 State Auditor
The following summary is based on an informal interview conducted with State Auditor Tim Keller. Auditor Keller is a former State Senator from Albuquerque and mayoral candidate. Auditor Keller received the interview questions in advance of the interview.

Keller noted that UNM has a lot of important and innovative research, tremendous facilities, and many well respected researchers. However, much of this work is not visible to the policy making community and the general public. Auditor Keller commented that UNM research has limited impact on actual decision making, but attributed this to the attitudes legislators have regarding research rather than the caliber of UNM’s work. In short, many legislators may perceive that the work that comes from academia (UNM included) is biased ideologically and it is therefore discarded. Keller suggested UNM consider hosting an event similar to the Domenici Institute’s annual conference which brings together legislators and academicians to discuss policy issues important to New Mexico and the legislature. Keller noted that strategically positioning UNM as a locus for research that can address important issues to the state could enhance UNM’s profile with the state’s legislature and agencies. He acknowledged that
UNM must find outside funding for research and the money available to conduct academic research may not align easily with the needs of the state.

Auditor Keller pointed to the grim budget realities facing the state and all other governmental units that will severely limit the amount of funding for UNM in the near future. In many cases, agencies have data that would be useful for deeper research but lack the human capital to pursue this research, which is where UNM could partner. He said the challenge is working through the “red tape” and overhead funding issues which can be confusing to these agencies given that many perceive UNM is already being funded generously by the state to support operations.
Appendix F: Federal Funding agencies

What follows is material taken from agency websites and documents. While much is paraphrased, some may be taken verbatim. URL's are provided.

**F.1 Department of Defense (DOD)**

The overall mission of the Department of Defense\(^3\) is: "To provide and support the military forces and capabilities needed to deter war and protect the security of our country."

Research relevant activities in the Department of Defense are interwoven through four main offices: Office of the Secretary of Defense, Department of the Army, Department of the Navy, and Department of the Air Force. The high level strategic plan for DOD provides little information on research-relevant priorities. The summary below is drawn from lower-level agency offices. As presented in chart 2, the overall 2016 DOD Research, Technology, Science and Evaluation budget in FY16 was over $70 billion, while the more research-oriented Science and Technology program is about $13 billion.\(^4\) The FY17 budget request is an overall increase of $2.4 billion (a less than 1% increase from the FY16)

For the DOD Research and Engineering Enterprise the research priorities include decision making and human-technology interface, resilient systems, cyber, electronics, countering weapons of mass destruction (WMD), and autonomous systems. The Defense Advanced Research Projects Agency (DARPA) has priorities that include systems technologies, adaptable systems, creative uses of existing technology, new technology possibilities from basic and interdisciplinary research. The Defense Threat Reduction Agency (DTRA) focuses on university engagement that is centered on topics of WMD sensing and recognition, network sciences, personnel and infrastructure protection, defeating or securing WMD, reducing chemical and biological threats. In the Army Research Office research topics include exotic quantum and extreme optical physics, fundamental chemical sciences, fundamental life sciences, fundamental social sciences, network sciences, mathematical sciences, materials research, mechanics, electronics and photonics. The Office of Naval Research supports activities including multi-scale/multi-physics modeling, dynamical systems, communication technologies, data analysis, arctic and global prediction, sensing, oceanography, space environment,

\(^3\)Strategic Plan information available at: http://www.dodig.mil/pubs/strategic_plan/index.html

desalination, materials science, bio robotics, decision making and human-machine interactions. The Air Force Office of Scientific Research sponsors activities that include dynamical systems and control, quantum and non-equilibrium processes, information, decision sciences, complex networks, big data, complex materials and devices, energy, and propulsion sciences. Of particular interest to UNM are the two Air Force Laboratory Technical Directorates located in Albuquerque, the Directed Energy and the Space Vehicles Directorates, with efforts in lasers, high-power electromagnetics, directed energy, space technology, remote sensing, satellite payload and operations technologies.

Figure A1 provides a history of DOD R&D spending by agency, while figure A2 breaks R&D spending by research type. As can be seen, seen in figure A1, Air Force, Navy, and the Defense Agencies account for the majority of the budget. Figure A2 suggests basic research budgets are fairly stable, while advanced technology development has declined since the 2008/2009 recession.
Figure A 1: DOD R&D SPENDING AUTHORITY (in billions of constant 2016 dollars)

Figure A 2: DOD R&D Spending Authority by Research Type (in billions of constant 2016 dollars)
F.2 National Institutes of Health (NIH) & Department of Health and Human Services (HHS)

The federal agencies that focus on Health and Human Behavior Oriented Federal Agencies, address issues such as strengthening health care, advancing scientific knowledge and the health, safety and well-being of the American people. These agencies aim to generate data to address societal issues, such as disaster response, poverty, prejudice, health disparities, mental and physical illness by translating scientific knowledge into practice. These agencies also aim to increase their focus on human diversity by increasing the scientific workforce and research participant samples as well as addressing social and human conditions that differentially affect minority groups. Another aim of these agencies is to increase the applications of basic scientific methods and tools to applied problems by supporting molecular and genetic approaches to health and fitness, supporting advanced technologies and advances in brain science and in the analysis of large and complex data systems. On a broader scale, these agencies aim to expand and change how science is conducted by encouraging interdisciplinary, trans-disciplinary and global research models and teams.

Specific NIH strategies include the advancement of biomedical research through basic biological research (i.e. BRAIN initiative), molecular immunology, basic, behavioral science research and data science (i.e. Big Data), among others. NIH also sets specific priorities through focusing funding on research on rare disease and consider the value of permanently eradicating disease. Health and Human Services aims to achieve their goals by basic as well as translational research, and specific strategies such as to expedite the development of breakthrough therapies and provide training to facilitate translation of basic laboratory discoveries into practice improvements.

Figure A3 breaks out historic appropriations and current budget asks by funding mechanisms. The majority of R&D comes through Research Project Grants (RPG). AAAS reports the success rate for submissions through the RPG has declined over the last decade falling from a success rate of 1 in 3 proposals to slightly less than 1 in 5 proposals. The overall FY17 request is slightly less than that in FY16, as some funding in the President’s budget was moved to mandatory spending.

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Figure A 3: NIH R&D SPENDING AUTHORITY BY FUNDING MECHANISM (IN MILLIONS OF CONSTANT 2016 DOLLARS)
F.3 U.S. Environmental Protection Agency (EPA)

The US Environmental Protection Agency’s (EPA) research focus continues to be in Clean Air and Climate; Homeland Security Research; Human Health Risk Assessment; Air Climate and Energy; Safe Sustainable Water Supplies; Sustainable and Health Communities; and Chemical Safety and Sustainability. Because of the continued disagreement between a Republican-led Congress and a Democratic President over EPA’s role in climate change initiatives, as can be seen in figure A4, EPA’s research budget has declined since 2010. AAAS estimates a 21% decline in the EPA’s research budget between 2007-2017.

Figure A 4: EPA R&D SPENDING AUTHORITY (IN MILLIONS OF CONSTANT 2016 DOLLARS)

36 Information available at https://www.epa.gov/planandbudget/strategicplan
F.4 Department of the Interior (DOI)
The Department of the Interior (DOI) is home to nine technical bureaus, however, the majority of R&D funding is through the U.S. Geological Survey (USGS). Priorities of the DOI are broadly categorized as youth; climate change; Native American issues; new energy frontiers; and water challenges. While some of these priorities are focused within a bureau, many are cross-cutting among a number of the bureaus. The priorities are developed within a number of mission areas. The increases, shown in figure A5 in spending authority are mainly in USGS budgets.

![Figure A5: DOI R&D SPENDING AUTHORITY (IN MILLIONS OF CONSTANT 2016 DOLLARS)](image)

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37 These include the National Parks Service; US Fish and Wildlife Service; Bureau of Indian Affairs; Bureau of Land Management; Office of Surface Mining and Reclamation; Bureau of Ocean Energy Management; Bureau of Safety and Environment; US Geological Survey; and Bureau of Reclamation.

F.5 Department of Energy (DOE)

The overall mission of the Department of Energy (DOE) is stated as:

"Enhance U.S. security and economic growth through transformative science, technology innovation, and market solutions to meet our energy, nuclear security, and environmental challenges"

The DOE is responsible for advancing the energy, environmental and nuclear security of the United States. High-level goals are organized in three main topics: (1) Science and Energy, (2) Nuclear Security, and (3) Management and Performance, and these topics map onto the organizational structure through three Under Secretaries. DOE operates 17 national laboratories (two located in New Mexico) that include national user facilities (e.g., the Center for Integrated Nanotechnologies, jointly operated by Los Alamos and Sandia National Laboratories). Research priorities include diverse energy sources, carbon capture and storage, nuclear power, advanced reactor concepts, new transportation technologies, materials science, batteries, fuel cells, biofuels, energy infrastructure, cyber security in the energy sector, discovery-focused research to increase understanding of matter and materials, basic research in physical sciences, advanced computing, biological and environmental sciences, plasma science, high energy physics and nuclear physics.

Figure A6 provides the historical R&D budgets for the DOE. The budget authority levels between 2008 and 2013, had some fluctuations, but were fairly flat. Between 2013 and the FY17 ask, the DOE budget has increased. The majority of the increase has been centered on energy efficiency and renewable energy.
F.6 Department of Agriculture (USDA)

The USDA articulates four goals that include research. These include assisting rural communities to become self-sustaining, re-populating, and economically thriving. This includes financial and market opportunities as well as contributions resulting in bio-economy expansion, specifically in the areas supporting development, production, and consumption of renewable energy and bio-based products. These goals result in a focus on preservation of forests and private lands through conservation, restoration, and improved resilience to climate change and enhanced water resources; increasing biotechnology exports and utilizing US agricultural resources to contribute to global food security and developing products for trade from new and emerging technologies, and; ensuring that all American children have access to safe, nutritious, and balanced meals. Figure A7 provides the USDA’s R&D budget history, broken out by program. The aggregate budget has fluctuated since 2000. Most of the fluctuations in the budget has been in the Agricultural Research Service.

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F.7 National Science Foundation (NSF)
The National Science Foundation in a sense sets the general trends for most federal funding agencies and therefore is likely the most representative view of the overall funding landscape. NSF’s Strategic Goal 1 is to transform the frontiers of science and engineering. NSF invests in: fundamental research to ensure significant continuing advances across science, engineering, and education; integration of education and research to support development of a diverse STEM workforce with cutting-edge capabilities; and world-class research infrastructure to enable major scientific advances.

NSF’s Strategic Goal 2 is to stimulate innovation and address societal needs through research and education. NSF strives to strengthen the links between fundamental research and societal needs through investments and partnerships and to build the capacity of the nation to address societal challenges using a suite of formal, informal, and broadly available STEM educational mechanisms.

There are clear communalities across the various NSF directorates that reflect the current focus of the agency through investments in over-arching initiatives and topics that span directorates. These include Understanding the Brain (UtB); Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS); Risk and Resilience (PREEVENTS); Cyberinfrastructure (CIF21) and Cyber-enabled Materials,

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Manufacturing, and Smart Systems (CMMSS). Each directorate also places special emphasis on supporting early career investigators.

On a broader scale, NSF recently published its six big research ideas, which are:

- Harnessing Data for 21st Century Science and Engineering;
- Shaping the New Human – Technology Frontier;
- Understanding the Rules of Life: Predicting Phenotype;
- The Quantum Leap: Leading the Next Quantum Revolution;
- Navigating the New Arctic; and
- Windows on the Universe: The Era of Multi-messenger Astrophysics.

Figure A8 provides a history of the NSF’s budget since 2000. Unlike some of the other agencies that have seen ebbs and flows, the NSF experienced growth between 2000 and 2004. In 2005, the budgets were cut, but then rebounded through 2010. Since 2010, the overall budget has trended slightly downward. The largest gains have been in the geosciences and computer and informational sciences – both have seen over 50% increases in budgets between 2007 and the asked for FY17 budget.
F.8 National Endowment for the Humanities

The National Endowment for the Humanities (NEH) typically funds cultural institutions, such as museums, archives, libraries, colleges, universities, public television, and radio stations, and to individual scholars.\(^4^2\) The grants strengthen teaching and learning; facility research; preserve cultural and education resources; and strengthen the institutional humanities base.

Goals include fostering the expansion of knowledge; nurturing the nation’s humanities infrastructure; and providing humanities experiences to all Americans. To facilitate this, grants are offered in educations, preservation and access; public programs; original research; digital humanities; bridging cultures; challenge grants; and partnerships.

The NEH budget decreased between 2010 and 2013. Since then, as can be seen in figure A9, appropriations have been flat.

\(^4^2\)Information available at [https://www.neh.gov/about/legal/strategic-plan](https://www.neh.gov/about/legal/strategic-plan)
F.9 National Endowment for the Arts

The National Endowment for the Arts (NEA) supports scholarly and cultural activity.\textsuperscript{43} It focuses on three elements that include works of art themselves; the ways art works on individuals; and art as work. Based on these tenants, the agency’s strategic goals and objectives focus on: projects involving arts creation; projects that engage audiences, learners, and whole communities; and projects that raise public awareness of the measurable contributions of artists and artworks in everyday life. Strategic goals of the NEA include supporting the creation of art that meets the highest standards of excellence; foster public engagement with diverse and excellent art; promote public knowledge and understanding about the contributions of the Arts; and increase the impact of art through strategic partnerships. Areas in which the NEA focus include:

Artistic Excellence, which focuses on the quality of artists, arts organizations, arts education providers, works of art, or services that the project will involve, as appropriate, artistic significance of the project and

Artistic Merit, which to the extent the project deepens and extends the arts’ value, including the ability to foster new connections and to exemplify creativity and innovation.

F.10 Department of Education

The Department of Education’s mission is to promote student achievement and preparation for global competitiveness by fostering educational excellence and ensuring equal access.\textsuperscript{44} To this end, goals include an increase in college degree attainment in America; Federal student aid transparency; support implementation of college- and career-ready standards and assessments; an increase in enrollment in high-quality state preschool programs; ensure equitable educational opportunities, and; enabling evidence-based decision making.

Figure A10 presents the Department’s budget data since 2010. There has been a steady decline in funding A number of programs funded by the Department of Education focus on improving student outcomes, especially among minority groups, for the Minority Science and Engineering Improvement Program; Title V – Developing Hispanic Serving Institutions; Title III – Hispanic Serving Institutions – STEM, and; the Native American –Serving Non-tribal Institution Program.

\textsuperscript{43} Information available at https://www.arts.gov/sites/default/files/NEAStrategicPlan2014-2018.pdf
\textsuperscript{44} Information available at https://www2.ed.gov/about/reports/strat/plan2014-18/strategic-plan.pdf
The National Aeronautics and Space Administration (2014) 2014 strategic plan centered on three broad goals: 1) expanding the frontiers of knowledge capabilities and opportunities; 2) to advance the understanding of Earth and develop technologies that improve the quality or life on Earth; and 3) to effectively manage NASA’s resources. Most research is included in goals 1 and 2. Objectives specific to goal 1 include: the advancement of space exploration; continue to conduct research at the International Space Station; extending partnerships with US industry for commercial space capabilities; improved understanding of the sun and its impact on Earth; as well as improved understanding of the Universe, and transformational space technologies. Objectives for goal 2 include the advancement of aeronautics research; advanced knowledge of Earth as a system to meet the challenge of environmental change; foster open innovation and facilitate technology infusion; and advance STEM education. Figure A11 presents NASA’s budget since 2000. Since the declines in the budget during the recession, the NASA budget has increased.

Figure A 11: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION SPENDING AUTHORITY (IN MILLIONS OF CONSTANT 2016 DOLLARS)
Appendix G: FOUNDATIONS

The following provides information about some of the foundations that operate in New Mexico and with whom UNM researchers have interacted. It is not meant to be an exhaustive review.

G.1 Robert Woods Johnson Foundation (RWJF)
The primary mission of the RWJF is to improve the health and health care of all Americans. The new initiative of the RWJF is to build a national culture of health which means cross-sector team based research and programming to address health outcomes. They note that they prefer to fund creative solutions and bold ideas with transformational potential. The RWJF Foundation has made significant contributions across the state of New Mexico and at UNM, including the RWJF Center on main campus and RWJF Collaborative in the College of Nursing. It appears, however, UNM has had limited success acquiring financial support specific to research.

G.2 W.K. Kellogg Foundation (WKKF)
The primary mission of the WKKF is to support children and families with a focus on vulnerable children ages 0-8. They have a research profile of racial and ethnic equality, poverty, and civic engagement. WKKF has invested in multiple entities at UNM including a significant investment in the College of Education, and is currently funding a team of researchers to evaluate their spending in New Mexico.

G.3 Ford Foundation
The Ford Foundation lists equity and human capital investment as core areas of funding. They create or assist with sustaining organizations working on a range of social change issues. The list of recently funded projects reveals significant funding for civic engagement and political participation, areas of strength in UNM’s political science department. The Ford Foundation recently revised their policies to allow for funding to support infrastructure.

G.4 Russell Sage Foundation
The Russell Sage Foundation has a principal focus in the social sciences and a narrow US focus. They note that work focused on improvement of social and living conditions in the United States is of interest to their goals, with the reduction of inequality across race, ethnicity, gender, and immigrant status being central to their mission. This is an area of strength for the social science department.

47 Information available at http://www.wkkf.org
48 Information available at https://www.fordfoundation.org
49 Information available at https://www.russellsage.org
**G. 5 Annie E. Casey Foundation**
The Annie E. Casey Foundation\(^{50}\) has a stated focus on children and families at risk with a heavy emphasis on program evaluation and impact assessment of funded efforts. They are more research focused than their counterpart, the Maggie Casey Foundation, but appear to have a larger interest in direct program funding rather than research. This Foundation has made investments in New Mexico, including large funding for NM Voices for Children.

**G.6 Chamiza Foundation**
The Chamiza Foundation’s mission is to provide support for programs that help ensure the continuity and “living” preservation of Pueblo culture and tradition.\(^{51}\) During its twenty-year history, Chamiza has provided grant support to all nineteen New Mexico Pueblos for programs that could be classified as “preservation of traditional life ways.” Since 1989 the foundation has made 339 grant awards totaling more than $2.3 million. Approximately 90% of the awards were direct to Pueblo tribes or tribal entities. The remainder was awarded to non-tribal entities conducting programs requested by the tribes.

**G.7 McCune Charitable Foundation**
The Marshall L. and Perrine D. McCune Charitable Foundation focuses on enriching the health, education, environment, cultural, and spiritual life of New Mexicans through fostering social change.\(^{52}\) The Foundation focuses on a variety of New Mexico issues including local economic development, childhood issues, health care issues, stewardship of natural resources, and rural economic development.

**G.8 Thornburg Foundation**
The Thornburg Foundation has three strategic initiatives in New Mexico.\(^{53}\) These include early childhood development; food and agriculture, and government reform.

There is a rather clear pattern across private foundations to focus on inequality and social justice. New Mexico’s demographics and high levels of poverty and inequality provide natural strength for UNM researchers to pursue research funding from these foundations below. The research goals tend to focus on children and families with an emphasis on program evaluation and implementation of interventions. To a smaller extent, regionally focused foundations and non-profits focus on environmental concerns. Below, a cross-section of Foundations are discussed from large national foundations.

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\(^{50}\) Information available at [http://www.aecf.org](http://www.aecf.org)

\(^{51}\) Information available at [http://www.chamiza.org](http://www.chamiza.org)

\(^{52}\) Information available at [http://nmmccune.org](http://nmmccune.org)

\(^{53}\) Information available at [http://thornburgfoundation.org](http://thornburgfoundation.org)
that focus on New Mexico to local foundations. This is not an exhaustive list of foundations supporting research in New Mexico.
Appendix H: PEER INSTITUTION RESEARCH STRATEGIC PLAN COMPARISONS

H.1 New Mexico State University

Three strategies are identified in the Campus Strategic Plan section on research. The first, research collaboration, is to adapt to a competitive research environment through strategic partnerships with regional, national and international institutions, governments, laboratories and industries. Consortia such as the NM Consortium, NM Collaborative Research and Development Council, Borderplex Alliance, Mountain West Consortium, and Central and Southern Plains Research Consortium are to be promoted. Further focus on leveraging and integrating labs, research centers, and experiment stations to realize new research and development projects. Second, research capabilities are addressed through enhancing research visibility by attracting and rewarding high profile researchers. Enrich research facilities, resources, and instrumentation, targeting investment toward research strengths (list below). Through mentoring, advance emerging research and creative activity. Third, student research is addressed by examining opportunities to optimize graduate student assistant financial support. Fostering student innovation and entrepreneurship through graduate and undergraduate engagement in independent study, internships, conferences, work experiences and access to research faculty, equipment, technology, and facilities.

Key performance indicators are given: Achieve 5% annual growth in submitted proposal dollars; achieve 1% annual increase in externally funded research; maintain $150,000 average funded research expenditures per tenure system faculty; achieve 1% annual increase in publications and creative works per faculty. Research strengths are identified in the RSP dated 7-30-12: Animal and Range Science; Biochemistry, Molecular Biology, and Genetics; Computer Science and Computer and Electrical Engineering; Energy and Biofuels; Environment and Ecology; Medical and Health Sciences; Plant and Soil Science; Space Science and Aerospace; and Water.

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54 New Mexico State University, sources are the Campus Strategic Plan, dated 12-22-15 section on research, and the RSP dated 7-30-12. More information can be found at https://plan.nmsu.edu/files/2012/07/Vision-2020-Plan-Adopted-7-21-2015-v-12-22-15.pdf and http://plan.nmsu.edu/files/2013/11/RSP_UAC_April-5VPRSTRATPLAN7-30-12.pdf
**H.2 University of Tennessee**\(^{55}\)

The University of Tennessee Campus Strategic plan section on research focuses on funding, an 83% increase in federal research expenditures, a 49% increase in total research expenditures, and an improved position to peers in both metrics since 2010 is noted.

In further detail (source is RSP dated 16 January 2014): There are 58 metrics covering Total Research Expenditures Growth, Federal Research Expenditures Growth, Engaged Outreach, Faculty Support, Student Supports, and Research Infrastructure Support.

**H.3 University of Texas at El Paso**\(^{56}\)

From the RSP: “UTEP’s strategic planning for research is based on four groups of objectives that deal with performance, growth, quality assurance, and efficiency gains. For each objective, quantitative outcomes have been determined and developed for the next decade.

**Performance**: First, UTEP’s strategic planning for research identified the following two as key performance objectives:

- annual expenditure of at least $100 million in externally funded research, according to commonly accepted national standards; and
- annual graduation of approximately 200 doctoral degrees.

**Growth**: Second, in order to achieve those outcomes, UTEP will have to grow in a number of critical dimensions, four of which have been identified as growth objectives. UTEP will increase its number of research-active faculty who are nationally competitive in acquisition of external funding and who will serve as the core faculty mentors and dissertation directors for doctoral students. UTEP is an emerging research university, and many of our doctoral programs are still within their first decade of operation. The University has yet to build out its full complement of PhD programs, and we have developed plans to grow current core faculty in strategically identified new areas of potential national distinction. New faculty and new doctoral programs will require significant increases in resources, including continuing growth at all programmatic levels.

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\(^{55}\) University of Tennessee, sources are the campus strategic plan section on Research, Scholarship, Creative Activity, and Engagement (top25.utk.edu/research) and also the RSP. More information can be found at http://top25.utk.edu/research/ and http://research.utdev4.wpengine.com/wp-content/uploads/sites/48/2014/01/FINAL-DRAFT-Top-25-SP-Metrics-for-RC-January-16-2014.pdf

\(^{56}\) University of Texas at El Paso, from the Research Strategic Plan dated 18 March 2010. More information can be found at http://www.utep.edu/aboutUTEP/strategic_plan_research.pdf
as UTEP strives to meet the educational needs of a large and historically under-served population. More students, more research, and more academic programs will all demand facilities, both new and renovated. These considerations will drive the following four supporting growth objectives:

- increase the number of tenured and tenure-track faculty from 508 to 720 by 2020;
- increase the number of PhD programs to 40 by 2020;
- increase student enrollment from 21,000 to 29,500 by 2020; and
- increase the provision of research, instructional, and associated support space by 3.2 M gross square feet (GSF) by 2020.

Quality Assurance: Third, UTEP’s strategic plan monitors the quality of the educational experience for UTEP students by tracking two critical quality assurance objectives that indicate the access of students to faculty teachers and mentors:

- maintain the overall University student/faculty ratio at approximately 21:1 and
- maintain the number of doctoral students per tenured/tenure-track faculty member at less than 3:1. These ratios have been set within the range of values at our aspirational peer institutions and those at leading national research universities in Texas.

Efficiency: Fourth, our analyses show that our past growth has been accomplished in part by efficiency gains over the last 5-10 years. Our models for increased performance in funded research and in graduation of doctoral students both build in continued incremental efficiency gains in the following measures and associated efficiency objectives:

- increased annual dollar volume of sponsored research per tenured/tenure-track faculty member at a rate higher than the rate of inflation; and
- reduction in time to doctoral degree after completion of coursework.

If UTEP maintains its best practices in growth of enrollment, faculty, program development and research productivity, if there are modest incremental efficiency gains, and if the Centennial Campaign successfully achieves its funding goal in 2014, the outcomes derived from the models project that UTEP will be able to achieve its primary performance benchmarks of $100 million in externally funded research and 200 PhD graduates per year within 7-8 years, or approximately by 2017-18. With increased System, state, federal and/or private investment, the models project that UTEP will be able to achieve more aggressive and strategic research and doctoral program growth that will permit earlier attainment of the Tier One benchmarks.”
The report continues, with identification of research priorities for special focus, which have already achieved national distinction, and seem poised for growth: Health & Biomedical Sciences and Engineering, Energy & Environment, Education for the 21st Century Demographic, National Defense and Border Security, and Global Enterprise & Border Studies.

Further cross-cutting themes are identified: Cyberinfrastructure and Collaborative Environments, Emerging Technologies: Information Technology, Biotechnology & Nanotechnology, and U.S. – Mexico and Latin America: Social and Behavioral Issues. Going forward, the emphasis will remain on the essential role played by their student demographic.

**H.4 University of Oklahoma**

The University of Oklahoma RSP begins with assessment of data relative to peers which indicated lower competitiveness, too many small proposals, fewer national centers, shallow expenditure growth trajectory, traditional and narrow research portfolio (NSF, NIH, NOAA), unmet potential with DOD, too few links with major universities, federal labs, private companies, too much individual entrepreneurship within faculty compared to need to institutional direction and alignment, insufficient resources for faculty research programs and proposal development.

The process of the strategic planning is outlined, with development of communication modes and action teams. Overall, agreement was to: think bigger, raise expectations and accountability, improve rewards and motivate risk-taking, seek more national centers and large projects, increase engagement with certain Federal agencies, submit higher quality, more competitive proposals overall, develop more effective ways of investing in research, establish an additional Federal presence in Norman, develop new support infrastructures and contracting vehicles, engage more effectively with industry, and be more active in driving the national research agenda.

The ultimate goal lies at the intersection of *competitiveness*, *engagement*, and *culture*. The objective to *transform research competitiveness* involves stimulating and supporting big thinking and transformative ideas, establishing national centers and programs, developing a few major cross-campus themes. Proposal development involves processes for funding. Faculty and programmatic excellence becomes part of each faculty hire, with attention to clusters, and expansion of analysis of research metrics. Part of the objective is to expand federal agency presence. Focus is also on graduate and undergraduate research, and new processes for proposal development.

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57 University of Oklahoma, source: Research Strategic Plan “Aspire 2020”. More information can be found at [https://aspire2020.ou.edu/purpose](https://aspire2020.ou.edu/purpose)
To transform research engagement, the focus is on the ability to engage across programs, with other organizations, aligning interests, building relationships, establishing mechanisms for pursuing new activities, and communication OU’s strengths and capabilities to multiple sectors. Strategies detail federal agencies, private foundations, private industry, inter- and intra-campus programs, and state agencies.

To transform research culture, the goal is an inspiring environment and institutional personality that fosters and rewards creativity and bold, transformative thinking, with maintaining accountability with highest standards of excellence. This is detailed via incentives, rewards, directed resources, standards of excellence, and accountability.

For the second half of the effort, ten goals are stated:

1. Broaden the opportunity space for support of faculty scholarship and mitigate against unexpected fluctuations in external funding sources. Strategy is to continue to diversify the external funding portfolio among federal agencies, with key initial actions noted.

2. Encourage and incentivize the pursuit of transformative ideas, the scaling up of ideas, and the development of external linkages with renowned individuals and organizations nationally and globally. Key actions to make the needed changes are noted.

3. Continue fostering an environment that tangibly promotes and supports the integration of teaching and research, incentivizes and rewards excellence in scholarship, and emphasizes shared strategic thinking and investment. Strategy is to work from the departmental to the institutional level.

4. Support research and creative activity that enhances national security, economic prosperity, and quality of life. Strategy is to increase emphasis on research in defense, security and intelligence sectors, particularly classified work. Expand activities in the arts, fine arts and humanities, moving more into collaborative and digital scholarship.

5. Enhance collaborations and resource sharing among campuses, and other organizations.

6. Continue supporting OU’s greatest strengths and emphasize interdisciplinary scholarship built around them, as well as the creation of new activities linked with them. Focus is on water/energy, risk/social/behavioral sciences, weather/climate, early childhood education, surface transportation, the humanities, and radar/remote sensing, building strategic linkage within state via EPSCoR.

7. Develop new research linkages with the private sector that bring opportunities for faculty and students, and that promote the transformation of scholarly outcomes into demonstrable value for society. Particular but not exclusive regard paid to R&D in the radar, energy, and bioscience/bioengineering sectors.

8. Continue building undergraduate research and substantially enhance its ubiquity, visibility, flexibility, and value as a core institutional strength and differentiator.
Continue working with the Graduate College to strengthen all aspects of the graduate student enterprise.

9. Invest in leadership development and help all faculty members, especially those early in their career, plan the long-term strategic direction of their research programs.

10. Develop new approaches for publicizing the value and outcomes of OU research and creative activities within Oklahoma as well as nationally and internationally. Strategy focuses on telling the OU research story with a specific purpose of enhancing collaborative opportunities and institutional prestige/competitiveness.
Dr. Melanie Moses Leading The Research Excellence Discussion:
Members: Melanie Moses (Chair), Vince Calhoun, Julie Coonrod, Kathryn McKnight, Mary Anne Newhall, Christine Sims, Tom Turner, Carman Melendrez, Caroline Smith (Co-Chair).
GOALS

The broad goals of the Research Excellence Working Group (REWG) were to characterize the breadth and depth of excellent research on the UNM main campus and to make recommendations to ensure that UNM continues to be one of the world's great research universities. The REWG attempted to identify the breadth of excellent research across large and small departments and centers at UNM, particularly those areas that are recognized as having significant national and/or local impact but have not been broadly recognized at UNM. The REWG also sought to highlight excellent UNM research that is distinctive, particularly research related to the environment, diverse communities, and natural and technological resources of New Mexico. The REWG also aimed to highlight interdisciplinary research, particularly research that draws from multiple schools to answer questions of national, global and regional importance.

METHODS

The REWG developed frameworks to characterize the breadth of ongoing excellent research and to identify opportunities for concerted effort and investment in broad areas of UNM research expertise that relate to local, national or global research priorities. We compiled a list of 30 criteria to evaluate excellent research and surveyed chairs and directors to determine the importance of each criterion to different research units.

Data were collected and analyzed from a variety of sources to obtain both a top down and bottom up view of ongoing research activities, funding levels and opportunities. Inaccuracies and lack of critical data, such as a list of UNM publications and research products, make a complete assessment of current areas of excellence impossible. However, the data compiled and analyzed by the REWG offer a window into UNM research activity and areas of excellence. We have initiated what we recommend as an ongoing OVPR endeavor to identify and invest in excellent UNM research.

Data Sources

Surveys
In the fall of 2016, the REWG surveyed 100 department chairs and center directors from all main campus schools and colleges and received 49 responses.

Participants were asked to:
• identify excellent and distinctive research in their unit or between their unit and others on or off campus
• identify criteria that characterize such research, particularly any criteria that do not fall into the usual quantitative measures of scholarly productivity.

They were asked to highlight where possible:
• research that is particularly ground-breaking, innovative, creative, high-impact and/or unique to UNM
• areas of excellent cross-cutting research that span multiple departments
• connections between research in their unit to broad questions, themes and/or societal problems
• ways to identify excellent research in their field using qualitative criteria as well as criteria that are more easily quantified, obvious, and applicable across many departments.

Participants provided:
• short lists and narrative descriptions of excellent research in each unit (Appendix A2)
• ratings of the importance of criteria to evaluate research excellence (Appendix A3)

As part of this effort, the REWG and OVPR compiled a list of research active units (departments and centers outside of departments). These units and their current chairs or directors are listed in Appendix A4.

Interviews
In fall 2016, the REWG interviewed 18 administrative leaders from across campus. Each was asked the following about UNM research efforts.
• What is distinctive about research at UNM?
• What stands out as excellent cross-cutting research?
• Can you identify organizational structures or best practices that have led to excellent and distinctive research?

The interviews also sought future opportunities for supporting research excellence.
• Can you identify untapped opportunities for excellent research?
• Can you suggest creative ideas for obtaining research funding?
• What non-obvious criteria can help capture excellent research?

Interview questions and a detailed summary of interview responses are listed in Appendix B. The summary is organized to highlight the breadth of research under the Breaking Barriers/Creating Connections framework, large interdisciplinary research areas that are potential areas of investment by the OVPR, and recommendations from interviews.

Quantitative Data Analysis
The following data were collected and analyzed to characterize levels of research activity across UNM departments. Methods to analyze the data, and tables highlighting key elements of the data appear in Appendix C. Because data from each source were categorized differently, and many programs do not fall neatly into different departments
or administrative units, many assumptions are made in order to provide a summary. The assumptions are also described in Appendix C. These data should not be interpreted without considering those assumptions and simplifications.

- Research expenditures by department from [fall 2015 – summer 2016] from the Office of the Vice President for Research
- Graduate students per department or program [fall semesters 2014 – 2016] from Graduate Studies
- Numbers, titles, and abstracts of dissertations and theses [2009 – August 2016] from the UNM Library
- Numbers of faculty per department on Main Campus, as of September 2016, from Faculty Contracts

Summary Of Prior Reports And Surveys
Many previous efforts have solicited information, summarized research activities and priorities and made recommendations for improvement. These efforts include the A&S hiring plans, ADR 2015 surveys, Community Engaged Research Plan, Provosts 2013 Interdisciplinary Report, 2016 Small Business Initiative Economic Development Report. Links to summaries of these reports are summarized in Appendix D.

FINDINGS

Several themes emerged from interviews and surveys. First, faculty (particularly those outside of STEM disciplines) advocate that the breadth of excellent research across the diverse colleges of the campus be recognized, publicized, and evaluated according to criteria appropriate for each discipline. Second, more should be done to recognize the importance of interdisciplinary research, community-engaged research, and research that reflects the experiences and interests of UNM’s diverse students and faculty. One of the distinctive characteristics of UNM is that it is the only flagship university in the country that is also a Hispanic-Serving Institution. By acknowledging the diversity of excellent research across the main campus colleges, UNM can draw upon its unique strengths to continue to be one of the world's leading research universities.

In the following sections, we identify criteria to evaluate excellent research (section 3.1) and then characterize research excellence on UNM Main Campus in terms of the breadth of excellent research and opportunities for large interdisciplinary research efforts (section 3.2), and quantitative measures of research activities (section 3.3).

Criteria To Evaluate Excellent UNM Research
The REWG identified 30 criteria to evaluate research excellence, organized into eight categories: Research Products, Novelty & Creativity, Recognition, Student Involvement,
Extending UNM Research Visibility, Community Engaged Research, Diversity, and Interdisciplinarity.

The 49 department chairs and center directors who completed the REWG survey identified several criteria as important across most disciplines. On a scale of 1 (not important) – 5 (very important), these criteria had a median rating of at least 4 (important): the quality and quantity of publications, novelty and creativity in research, distinctive nature of research, academic awards/distinctions and invited talks, and the number of students mentored and dissertations produced.

The responses highlight the importance of criteria that are not easily quantified, such as novelty, creativity and impact on the thinking of a field. Thus, evaluation of excellence necessitates a process that includes human judgment and qualitative assessment to augment any automated data gathering process. Even when research products can be counted, an assessment of excellence requires integrating quantitative metrics with human expertise.

One of the most notable findings from the survey is that different departments, centers and colleges emphasize very different criteria for evaluating excellence. Most criteria were rated very differently by different departments: more than half of the 30 criteria received all possible scores (1 – 5) from at least one respondent. Figure 1a shows the breadth of opinion about the relevance of each of the 30 criteria to each college, and Figure 1b lists the top-rated criteria by college. More details of the responses are shown in Appendix A3, both as a summary of all responses, and the responses per college.
Figure 12a: The importance of 30 criteria for evaluating research excellence identified by department chairs and center directors. 1 is not important and 5 is essential. Each point is the mean response of one college. University-wide centers are in a single category. This figure highlights that different colleges have very different assessments of which criteria are important.

An additional 30 criteria were provided by survey respondents (also listed in Appendix A3). Most of the additional criteria were specific to that particular department. Other answers indicated conflicting opinions, for example, that impact factors were either very important or not important at all; that national reputation is essential vs. that impact on local communities is most important.

This section provides a brief overview of notable areas of research activity at UNM. It is based primarily on the survey of chairs and directors and on interviews that were conducted with ADRs and other administrators. More comprehensive information about areas of research excellence is provided in Appendix A2 in the words of the chairs and directors who responded to the survey, representing approximately half of the research-active units on main campus. Appendix B summarizes areas of research excellence as highlighted by administrators that were interviewed. Anyone interested in understanding the rich and varied research at UNM is strongly encouraged to read those appendices. The survey results were collated and assessed with respect to how different research activities contribute to Breaking Barriers and Creating Connections. Research that contributes to breaking barriers can be creating new knowledge and understanding, promoting creativity, novelty and artistic expression, breaking barriers between disciplines, between the academy and the wider community, and between the academy and under-represented groups. Research can also create connections among different groups, particularly through interdisciplinary collaborations and community-based research.
The key result of this activity is documentation of the incredible diversity of UNM research programs that produce outstanding research. Having excellent research in such a wide array of disciplines is a hallmark of a world class research university. The Word Cloud in Figure 2 highlights key terms from survey responses, and Figure 3 shows terms that occurred in titles and abstracts of Masters theses and PhD dissertations, another indicator of areas of scholarly activity. Terms that occurred frequently in the surveys highlight several key research areas, for example: community, indigenous, environment, language, water and energy. Regional terms including Mexico, New Mexico and Southwest occur frequently. Technological terms that highlight research strengths in the School of Engineering and the natural sciences emphasized research in materials, nano-science, optics and computation including quantum computation, modeling, and simulation.

Figure 13: Word frequency diagram with larger font size indicating terms more frequently used in responses to the chairs and directors survey. A complete list of areas of research excellence from the survey appears in Appendix A.
The “Breaking Barriers and Creating Connections” framework highlights examples of excellent research including: new discoveries and solutions in science and engineering, to community engaged research in education, art and architecture that transforms lives in New Mexico and beyond, and a breadth of expertise being combined into cutting-edge interdisciplinary research. Survey responses demonstrate a stunning breadth of excellent research across the schools, colleges and centers on main campus. Fascinating research in highly funded centers and small departments, in science, engineering, humanities, arts, education, business and architecture engages the local communities of New Mexico and pushes the frontiers of human knowledge at a global scale.

The framework highlights interdisciplinary research at UNM that focuses on important problems facing New Mexico, the nation, and the world, such as: poverty, energy production, water and arid lands, health, disease and education, and issues surrounding diversity, race and ethnicity, biodiversity, environmental issues and sustainability. Much of the interdisciplinary work at UNM is conducted in collaborations with the Health Sciences Center, the Mind Research Network and Sandia and Los Alamos National Labs which have more PhDs from UNM than any other university. Examples of interdisciplinary programs include those focused on health, education and environment,
including the Social Determinants of Health Collaborative, Robert Wood Johnson sponsored research initiatives in Education, and CASAA. Other areas include Bioinformatics, Race and Ethnicity, the Center for Stable Isotopes, Quantum Information, Optics, Energy, Water, Big Data and Informatics, Remote Sensing, Environmental/Spatial Research in Arid Lands and the A&S Humanities Initiative.

The framework also provided a tool for perceiving larger themes amongst the many areas of research excellence that were highlighted in survey responses. Out of this vast diversity, the REWG attempted to identify a small number of themes that re-occurred across a range of departments, centers, and colleges. We also sought to align areas of UNM expertise with local, state and national research priorities identified by the Environmental Scan. Three that seemed to stand out were a range of social and cultural research related to the Southwest, the field of renewable energy, and a variety of activities relating in various ways to the theme of “water in the west”. Here we highlight these three areas and demonstrate that they incorporate a diversity of activity both within and across traditional disciplinary boundaries.

Social And Cultural Place-Based Research Relating To The Southwest.
Many researchers at UNM direct their activity towards topics of particular relevance to New Mexico, and more broadly to the Southwest and Latin America. The rich cultural heritage of New Mexico shapes much activity relating to the arts, humanities, social sciences, and language. This includes numerous departments across the colleges, and a number of research centers, including the highly interdisciplinary Latin American and Iberian Institute (LAI). UNM also has strengths in community-based research notably in Education, Fine Arts, Architecture & Planning, and some departments of Arts & Sciences. Museum-based research and exhibitions, and innovative place-based programs in the College of Fine Arts are other examples of creative research that draws from and serves the community. Anderson School programs work in local communities to foster economic development, for example, Innovate ABQ and the UNM Small Business Institute. There are also excellent place-based research programs relating to health and addiction, for example in CASAA, and research relating to issues surrounding poverty and diverse populations, particularly in Native, Hispanic and rural communities.

Place-based research in Education, Fine Arts, and Architecture and Planning occurs through well-defined community-engaged research missions. Architecture has one of the strongest community-based planning departments in the nation. The internationally recognized research programs of Fine Arts such as Indigenous and Latin American Arts and Flamenco Studies engage the community in performance and creativity in music, art, cinema, theater, dance and museum exhibits.
Much of the place-based research springs from the diverse student population that fosters excellent research in areas of interest to the communities we serve. For example, the College of Education is dedicated to improving conditions for New Mexico’s diverse populations by transforming teacher preparation and assessing impact in local schools and communities. Many departments, ethnic studies programs and interdisciplinary centers and institutes such as SHRI, LAII, and the Institute for the Study of “Race” and Social Justice have research missions rooted Native and Hispanic communities of New Mexico.

Renewable Energy.
UNM has high profile research in renewable energy infrastructure and technology, including materials, nanoscience and photonics in the School of Engineering and the College of Arts & Sciences, with important connections to the National Labs. This work is enhanced by EPSCoR which is improving the infrastructure for research in energy, as well as contributing to the development of human resources needed for work in this area.

The CHTM and CMEM centers are nationally known for research in energy, materials and photonics; Chemistry and Biology are researching biofuels and multiple SOE departments are developing smart grid and solar cell technologies. UNM is well positioned in research into economic and environmental impact of different energy sources. There are also opportunities to link expertise in climate and ecological research (where Earth & Planetary Science and Biology have strong national reputations) to clean energy, particularly wind and solar that are abundant in New Mexico, and to the extractive energy industries that currently dominate the New Mexico economy.

Research in renewable energy can focus on other UNM strengths that NSF highlights as STEM research priorities: advanced manufacturing, nanotech, materials & optics and advanced computing including human-technology interaction, high performance computing, data analysis and modeling, robotics, cybersecurity, quantum computation, and the “internet of things”. Research in these areas, particularly in collaboration with the national labs and AFRL has potential to make substantial contributions to renewable energy technologies and infrastructure. Fostering a research ecosystem around materials, nanoscience and renewable energy also can contribute significantly to economic development in New Mexico.

Water In The West.
Obviously a topic of great regional importance, research in this area can also be seen as “place-based”. It draws on broad expertise at UNM surrounding water scarcity in the
arid Southwest and its effect on policy, the environment, and communities. Thus this area of research relates not only to those seeking solutions to water scarcity through engineering, natural sciences, planning, landscaping and Sustainability Studies, but also those who model its implications computationally, who explore it in art, who study its consequences throughout history and across different communities, and who work to develop policy dealing with this pervasive issue.

This cross-disciplinary research area has participation from Biology, Earth & Planetary Sciences, Economics, Geography, Civil Engineering, and Water Resources Program, Architecture and Planning, the Utton Center (Law) and the Center for Water and the Environment. The NSF-funded Women, Work, Water Initiative draws from this expertise to explore the role of the humanities in scientific research, introducing narrative and visual arts to the sciences while introducing data concepts to humanities faculty and students. Water in the west has been recognized as an opportunity for a cluster hire for years.

Specific examples of UNM expertise in this area include research into acequias, water systems, and planning and design in arid lands; Art and Ecology programs including Land Arts of the American West; studies of the stresses produced by climate change in Latin American Societies related to water supply, flooding and reduced or altered agricultural productivity; effect of water on ecosystems, disease ecology and health informed by state-of-the-art microbiology and gene sequencing facilities; sustainability studies, including cross-disciplinary food inquiry; improved climate models through use of high performance computing and remote sensing in collaboration with the national labs; Archeology of the Southwest and Mexico related to land-use, water use, and climate change. There is great potential to link research strengths in water problems and remediation to UNM research leadership in climate, arid ecosystems and ecology research.

Quantitative Data On Research Activity
Our analysis highlights certain departments that stand out as having particularly high numbers of graduate students, numbers of faculty, dissertations produced, and external research funding levels. The data that were assembled for this report are included in Appendix C. Notably absent is any measure of scholarly productivity or metrics of quality because these data have not been collected.

The largest faculty are in Biology and Electrical & Computer Engineering (which also has one of the largest graduate student populations). Particularly large graduate student populations are in the College of Education, the School of Public Administration, the School of Engineering (Computer Engineering, Computer Science, interdisciplinary programs) and the College of Arts & Sciences (Anthropology and Biology, although
Psychology stands out as producing large numbers of theses and dissertations. The graph below highlights the varying ratios of faculty to graduate students across departments; those with very high numbers of graduate students but relatively small faculty numbers warrant investment in additional faculty lines. [Note that these numbers include only those faculty and students specifically associated with programs within departments; interdisciplinary programs are excluded.]

![Graph](image)

*Figure 15: Number of graduate students and number of faculty per department*

Substantial research funding is awarded to centers, particularly those affiliated with the OVPR (EPSCoR, CASAA, CHTM, CMEM) and the School of Engineering. The top units in terms of research funding, with annual expenditures (in order) between $12 and $3 million dollars are EPSCoR, Biology, Continuing Education Education, Electrical and Computer Engineering, Computer Science, Center on Alcoholism, Substance Abuse and Addictions (CASAA), Institute of Meteoritics, Center for High Tech Materials (CHTM), Center for Micro-Engineered Materials (CMEM), Physics & Astronomy, Chemistry, and the Center for Water and the Environment.

**ACTION PLAN**

Based on the above findings, the REWG identified five strategic objectives to increase excellent research at UNM. The first two are to improve the research infrastructure and develop a culture that supports research excellence by incentivizing, rewarding and communicating research excellence and by developing a culture of trust, inclusion, cooperation and collaboration. These recommendations are addressed in the Infrastructure and Human Capital reports. In addition, we suggest that UNM embark on the following three strategic objectives and associated tactics to achieve the goal of
assessing, enhancing and recognizing research excellence across the diversity of research programs across campus.

**Objective 1: Develop a mechanism to assess and communicate research excellence across the diversity of research programs on campus.**

**Task 1.A.** The OVPR will provide input for the Provost’s Office as they are in the process of developing a mechanism of collecting faculty information to create an annual summary of scholarly and creative activities on campus. As the findings of this report suggest, the summary should provide research excellence criteria measurements, as defined by the Dean of each college, and recognize that these criteria may be different between colleges. Following the collection of the data, the OVPR will work with the ADRs to analyze the data with respect to the diversity of research and will distribute a report to university leadership, faculty listservs and will post the report to the OVPR website.

   Metrics: Enhanced awareness of research activities as assessed on an annual basis through a research strategic plan (RSP) survey. Increased engagement with UNM upper leadership regarding the breadth and depth of excellent research taking place at the institution.
   Timeline: The data gathering process will be prototyped during the spring of FY2017. Full data collection and the analysis of data will take place during the spring of FY2018. The first report of Research Excellence will be completed and distributed late spring FY2018.

**Task 1.B.** Following the OVPR/ADR analysis of the scholarly and creative activities on campus, the OVPR will work with ADRs/Center Directors to identify cross-cutting areas of research strength. The findings of this analysis will be posted to the OVPR website.

   Metrics: Cross-cutting areas of strength will be identified and publicly recognized on the OVPR website.
   Timeline: Full data collection and the analysis of data will take place during the spring of FY2018. The areas identified as cross-cutting areas of research strength will be posted to the OVPR website spring FY2018 and annually thereafter.

**Task 1.C.** The OVPR will collaborate with the Provost’s Office with the goal of creating and publishing a searchable database with the data acquired through the annual summary of scholarly and creative activities on campus.

   Metrics: Enhanced awareness of research activities as assessed on an annual basis through a research strategic plan (RSP) survey. Increased engagement
with UNM upper leadership regarding the breadth and depth of excellent research taking place at the institution.

Timeline: The timeline for creation of the database will be determined by the Provost’s Office

**Task 1.D.** The OVPR will communicate, to the College Deans and Department Chairs, the identified cross-cutting areas of research strength and the areas of existing and growing research excellence to encourage and support resource allocation (including faculty hiring) directed toward these areas.

Metrics: Resource allocation, including faculty hires, will be directed toward areas of research excellence and those representing cross-cutting areas of research strength. Increases in areas identified as cross-cutting and/or excellent will be assessed on an annual basis through the RSP survey.

Timeline: The information will be distributed to Deans and Chairs spring FY2018.

**Objective 2: Develop a plan for investments into new research areas.**

**Task 2.A.** Through the process involved to create this report, the REWG identified areas of cross-cutting excellence. The OVPR will provide and communicate institutional support programs for the three areas identified by the working group. Specifically: 1) Place-based social and cultural research, 2) Renewable energy and 3) Water in the West, exploring water, environment and climate.

Metrics: The performance of the identified areas will be evaluated by June 30, 2018 to determine if the institution has realized an increase in research proposals and awards in the emerging areas.

Timeline: The initial investments into the three identified areas will be made by June 30, 2017.

**Task 2.B.** Utilizing the data acquired from the annual summary of scholarly and creative activities on campus and the subsequent analysis by the OVPR and ADRs, the OVPR will seek to identify possible new areas for investment. Resources (financial and otherwise) will be made available to existing and emerging areas of research excellence as well as cross-cutting areas identified through this process.

Metrics: The performance of the identified areas will be evaluated annually to determine if the institution has realized an increase in research activity in the investment areas.

Timeline: The evaluation of possible new areas for investment will begin spring FY2018 and continue annually corresponding with the annual summary of scholarly and creative activities on campus.
Task 2.C. The OVPR will communicate a UNM vision for research that includes the areas of cross-cutting strength, existing and emerging research excellence and investments into new research areas. The vision will be publicized via the OVPR website and the annual summary.

Metrics: The OVPR is committed to enhancing the awareness of research activities across the campus and to communicate investments made in new research areas.

Timeline: The UNM vision for research will be developed and publicized on the newly revised OVPR website spring FY2017. The vision statement and changes to investment areas will be updated (if necessary) annually thereafter.

Objective 3: Improve and encourage excellent interdisciplinary research.

Task 3.A. In 2013, the Provost established a committee to improve Interdisciplinary Research and Education. The OVPR will address recommendations from the Provost committee (pertaining to interdisciplinary research) by including these recommendations in the RSP Action Plan with objectives, metrics and timelines. In addition, a dedicated leadership position should be established to take charge of Interdisciplinary research initiatives, including those recommended in the human capital report, particularly

- Articulate procedures and policies and available administrative and financial support to faculty who wish to establish interdisciplinary research programs
- Develop procedures for hiring, evaluating, and promoting faculty conducting interdisciplinary research
- Encourage "bottom up" faculty collaboration by supporting research in particular themes and problems through seed funding, allocation of grant writing support and administrative support. Encourage formal and informal exchange of ideas in interdisciplinary spaces. Build upon the newly established Interdisciplinary Research Discussion Groups in this effort and promote these groups as initial mechanisms to start research centers.
- Reward collaborative efforts, for example through financial incentives, teaching releases, or administrative support.
- Work with the Provost, ADRs, Deans and center directors to overcome existing barriers to interdisciplinary research and education including: rigid organizational structure and administration silos, department/discipline-centric hiring and promotion, inadequate funding, marginality of ID research, teaching, service, advising, and mentoring.

Metric: Interdisciplinary research will be prominent in the strategic plan for the newly developed structure, with subsequent measures of increase in interdisciplinary research.
Timeline: The timeline for individual recommendations are addressed within the RSP Action Plan.

Task 3.B. The OVPR will initiate a closer working relationship with the Office of Community-Engaged Research. The Director of the Office of Community-Engaged Research will be invited to participate as a member of the ADR/CD group and to attend meetings and discussions where opportunities for collaboration in community-engaged research can be explored. In addition, if opportunities are identified through the annual summary review process, the OVPR will communicate and collaborate with the Office of Community-Engaged Research as appropriate.

Metrics: The Director of the Office of Community-Engaged Research will become a member of the ADR/CD group and will be included in meeting and discussions with the OVPR regarding opportunities for collaboration in community-engaged research.

Timeline: An introductory meeting will be scheduled with the Director of the Office of Community-Engaged Research early spring FY2017. The Director will be invited to participate in monthly ADR/CD meetings thereafter.

ACKNOWLEDGMENTS

The REWG gratefully acknowledges the contributions to this report of the 18 interviewees and 49 survey respondents, the OVPR staff (Grace Faustino, Carman Melendrez, Isela Roeder, Mary Jo Daniel, Monica Fishel, Stephanie Tofighi), Kevin Comerford and Karl Benedict from University Libraries, and other UNM administrative units that supported surveys and other data collection efforts. These collective efforts from staff, administration and faculty demonstrate the value of shared governance at UNM.
Appendix A1: Survey Questions

The survey questions, including the list of criteria evaluated by chairs and directors, is available here:
https://unmm-
my.sharepoint.com/personal/research_unm_edu/ layouts/15/guestaccess.aspx?guesta
ccesstoken=wl8Ced0d8h7PjFR9QRUTdz7bSg7FkL0CRGv6DDd5DEE%3d&docid=073e108aa119e45198e1e14ca54fee88c&rev=1
Research Excellence on UNM Main Campus Survey

Dear Department Chairs and Center Directors,

The Office of the Vice President for Research at UNM is in the process of developing a Research Strategic Plan. As part of that effort, the Research Excellence Working Group is charged with exploring and characterizing excellent and distinctive research at UNM. Our goal is to produce an accurate and inspiring picture of UNM research (hover your mouse here for a definition). This picture will be used to foster internal and external collaborations, leverage investments in areas of strength and potential growth, and to broadly communicate the areas of strength of UNM research. We aim to highlight the distinctive high quality research in smaller programs along with large and highly funded research programs that are more easily identified.

This survey is one among several top-down and bottom-up mechanisms to identify research excellence at UNM. Your input is crucial to mitigate the inherent difficulties in identifying excellent research across a broad diversity of programs and assessing research with objective criteria.

Please take this opportunity to use your judgement as chairs and directors to highlight excellent and distinctive research, including that which might not be evident from quantitative metrics. Please
1. identify excellent and distinctive research in your unit or between your unit and others on or off campus
2. identify criteria with which to identify such research, particularly any criteria that do not fall into the usual quantitative measures of scholarly productivity.

Please use language that can be appreciated by a broad audience of academics in other disciplines as well as the external community. Please highlight the following where possible
• research that is particularly ground-breaking, innovative, creative, high-impact and/or unique to UNM
• areas of excellent cross-cutting research that span multiple departments
• connections between research in your unit to broad questions, themes and/or societal problems
• ways to identify excellent research in your field using qualitative criteria as well as criteria that are more easily quantified, obvious, and applicable across many departments.

So that we may summarize research at UNM under a coherent narrative, we ask you to relate research in your unit to an overall theme of “Breaking Barriers and Creating Connections”. We encourage you to think broadly and to highlight how research is:
1. Breaking Barriers to new knowledge and understanding
2. Breaking Barriers between communities and the academy in community engaged research
3. Breaking Barriers to underrepresented populations and topics to promote diversity in academic research
4. Breaking Barriers in expression by fostering creativity, performance or novelty
5. Creating Connections through interdisciplinary research efforts organized around problems or themes that transcend traditional disciplinary categories
6. Creating Connections between research and education by engaging students in research or incorporating research into the classroom and educational activities.

Your input is a vital component of the UNM Research Strategic Plan. We hope that you will embrace this opportunity to communicate the excellent research by your faculty and students to the rest of the University. Thank you for contributing your valuable time to complete this survey. Please respond by November 11, 2016.

If you have questions or need help with technical issues email: gfaustin@unm.edu

A SURVEY OF UNM MAIN CAMPUS RESEARCH EXCELLENCE

Question 1.

CONTACT INFORMATION

Q1a:
First Name:

Last Name:

Q1b:
The department or unit for which you are chair or director:

Q1c: How long have you served in this role?

☐ Less than 1 year    ☐ 1-3 years    ☐ 3-5 years    ☐ More than 5 years

If you have chosen "other", please specify:

[Blank Space]
Q1d: How long have you been faculty at UNM?

☐ Less than 1 year  ☐ 1-3 years  ☐ 3-5 years  ☐ More than 5 years

If you have chosen "other", please specify:

Question 2.

AREAS OF RESEARCH EXCELLENCE
Please identify a small number (1 - 5) of areas of research that are excellent and/or distinctive in your unit. In each area please indicate the fraction of that research that is done through collaborations outside your unit so that we can identify **cross-cutting efforts that involve collaboration with other units at UNM or external collaborators in other disciplines**. (hover your mouse here for examples of cross-cutting research).

We do not expect that this short list will include all research in your unit. We encourage you to summarize areas of research excellence into efforts involving multiple faculty. Please use language that can be understood by those outside your department or center.

The short answers will be included in an appendix to the report of the Research Strategic Planning Committee. We encourage you to use the narrative to communicate whatever you think is most relevant about research excellence in your unit. You may wish to explain the short answers in more detail, or to highlight other areas of excellence in your unit. The narratives and short answers will be aggregated and summarized in the report.

Chairs, please note that we have requested input from Research Centers that cross department boundaries, but department chairs should include in your summary the activities of centers wholly within your unit.
Q2a:
Area of research excellence 1 (required) Limit: 300 characters (approx. 30 words).

What fraction of this work (if any) is done through research collaborations outside of your unit?

- [ ] none
- [ ] <20%
- [ ] 20% - 50%
- [ ] > 50%

Q2b:
Area of research excellence 2 (optional) Limit: 300 characters (approx. 30 words).

What fraction of this work (if any) is done through research collaborations outside of your unit?

- [ ] None
- [ ] < 20%
- [ ] 20% - 50%
- [ ] > 50%

Q2c:
Area of research excellence 3 (optional) Limit: 300 characters (approx. 30 words).

What fraction of this work (if any) is done through research collaborations outside of your unit?

- [ ] None
- [ ] < 20%
- [ ] 20% - 50%
- [ ] > 50%

Q2d:
Area of research excellence 4 (optional) Limit: 300 characters (approx. 30 words).

What fraction of this work (if any) is done through research collaborations outside of your unit?
Q2e: Area of research excellence 5 (optional) Limit: 300 characters (approx. 30 words).

What fraction of this work (if any) is done through research collaborations outside of your unit?

Q2f: Please provide a narrative describing the excellent and distinctive research in your unit? (required)

Limit: 2500 characters (approx. 250 words)
Question 3.

CRITERIA FOR EVALUATING RESEARCH

Please indicate how important each of the following criteria are in assessing research excellence in your unit. These criteria are grouped into categories for convenience, but these are not intended to be mutually exclusive. Please include criteria regardless of whether they are difficult to measure, quantify, or assess with an automated procedure.

Q3a: Research Products

<table>
<thead>
<tr>
<th></th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
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</thead>
<tbody>
<tr>
<td>Prestige or selectiveness of grants</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Quantity of research funding</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Numbers of publications: books, journals or other print</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Quality of publications as measured by impact factors, citation indices, and other qualitative measures</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Numbers of installations, exhibitions or performances</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>Quality of installations, exhibitions or performances</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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<tr>
<td>Numbers of patents</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
</tr>
<tr>
<td>New initiatives or programs that have resulted from research</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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</table>

**Q3b: Novelty and Creativity in Research**

<table>
<thead>
<tr>
<th>Distinctiveness or unique aspects of research or innovation and creativity of research approach</th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research that generates new conversations, methods or approaches</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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</tr>
<tr>
<td>Demonstrable impact upon the way a discipline (or the public or other stakeholders) views subject matter</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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</tbody>
</table>

**Q3c: Recognition**

<table>
<thead>
<tr>
<th>Invited talks, keynote addresses or public forums</th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
</tr>
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<tbody>
<tr>
<td>Academic awards, distinctions or fellowships</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
<td>〇</td>
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<tr>
<td>Membership in outside organizations, e.g., boards, research institutes, and non-profits</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Performance in competitions</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

### Q3d: Student involvement in research

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<tr>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students and post-docs mentored &amp; theses or dissertations produced</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Placement and recognition of students, e.g., subsequent graduate or postdoctoral positions, internships, faculty positions, awards, etc.</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>New course offering stemming from research programs</td>
<td>○</td>
<td>○</td>
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</table>

### Q3e: Extending research visibility outside the university

<table>
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<tr>
<th>Not important</th>
<th>Of Little Importance</th>
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<th>Very Important</th>
<th>Essential</th>
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<tbody>
<tr>
<td>Coverage in local/national/international print or online media</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>High visibility collaborations with external institutions or scholars</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
<tr>
<td>Impact on public policy</td>
<td>○</td>
<td>○</td>
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</table>
### Q3f: Community Engaged Research

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<tr>
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<th>Important</th>
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<tbody>
<tr>
<td>Community partners engaged in design, implementation,</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>interpretation and/or assessment of research</td>
<td></td>
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<tr>
<td>Academic service learning that fills demonstrated</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>community needs</td>
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<tr>
<td>Outreach: number and diversity of community members that</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>participate in or learn from or about the research</td>
<td></td>
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</table>

### Q3g: Diversity in Research

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<th>Very Important</th>
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</thead>
<tbody>
<tr>
<td>Numbers of underrepresented students and faculty engaged in</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>research</td>
<td></td>
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<tr>
<td>Numbers and diversity of students in undergraduate research</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>opportunity programs</td>
<td></td>
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<tr>
<td>Research topics focusing on underrepresented or underserved</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>groups</td>
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</table>
Q3b: Interdisciplinary Research

<table>
<thead>
<tr>
<th></th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
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</thead>
<tbody>
<tr>
<td>Number of publications outside primary discipline</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Appointments in multiple departments or outside of field of Ph.D.</td>
<td>○</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Collaborations (publications, grants) with faculty in other disciplines</td>
<td>○</td>
<td>○</td>
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Question 4.

ADDITIONAL CRITERIA FOR EVALUATING RESEARCH
Please list any criteria for evaluating research that were not previously listed, and indicate how important they are in your unit (optional).

Q4a: Criteria for evaluating research 1 (optional) Limit: 300 characters (approx. 30 words).

<table>
<thead>
<tr>
<th></th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very important</th>
<th>Essential</th>
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</thead>
<tbody>
<tr>
<td>Please rate your first criteria for evaluating research</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tr>
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</table>

Q4b: Criteria for evaluating research 2 (optional) Limit: 300 characters (approx. 30 words).
<table>
<thead>
<tr>
<th>Criteria for evaluating research</th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very Important</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please rate your second criteria for evaluating research</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</table>

Q4c: Criteria for evaluating research 3 (optional) Limit: 300 characters (approx. 30 words).

<table>
<thead>
<tr>
<th>Criteria for evaluating research</th>
<th>Not important</th>
<th>Of Little Importance</th>
<th>Important</th>
<th>Very important</th>
<th>Essential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please rate your third criteria for evaluating research</td>
<td>○</td>
<td>○</td>
<td>○</td>
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</tbody>
</table>

Q5: Is there anything else you would like to add about research excellence at UNM? (optional)

Limit 1000 characters (approx. 100 words)
Appendix A2: Summary of Survey of Chairs and Directors

Breaking Barriers To New Knowledge And Understanding.

- **Accounting**: Our department has an eclectic research focus including four researchers that look at the social implication of accounting systems and who publish extensively in Europe, Australia and across North America. One, Joni Young, is considered a leading expert in regulation worldwide and works extensively with researchers at the London School of Economics. Richard Brody is a leading expert in fraud and forensics. He is called upon to speak on white-collar crime and information security across the nation. Leslie Oakes is a leading accounting historian who has published widely in both management and accounting journals. She has been an invited speaker across Canada, Australia and Europe.

- **Anthropology**: Evolutionary anthropology of the whole human organism in its ecological, social and cultural environment that inspires interaction with the social, biomedical and physical sciences.

- **Anthropology**: Multiple active research projects on past societies (from the Paleolithic through historic periods) and landscapes in a range of regional and international locations

- **Anthropology**: Theoretical/Analytic Areas of Expertise, Excellence and Distinction include: Ceramic analysis; Evolution of prehistoric agriculture; geospatial analysis; ancient agriculture and water management in arid environments; paleoanthropology; religion and emergent social complexity; museum studies, archaeological collections, cultural heritage and public museums; landscape transformation.

- **Biology**: As one of the largest academic units in the state, the 39 faculty of the Department of Biology encompass several areas of excellence. A long-standing strength is in Ecology and Evolutionary Biology, spanning many taxa, scales and perspectives. Research in the area of Biological Responses to Climate Change has focused on the effect of climate fluctuation and change on microbial, organismal, community and ecosystem processes over a range of time scales and includes connections with Geography, Earth and Planetary Sciences, and the Center for Stable Isotopes in A&S, as well as Civil Engineering. The faculty in the area of Cellular and Molecular Biology comprise another area of excellence in Biology. This area includes excellent and growing research in immunology, cell biology and development. Another area of research excellence is Phylogeny, Systematics and Biogeography.

- **The Center on Alcoholism, Substance Abuse, and Addictions (CASAA)** is a Category III center dedicated to research to reduce suffering caused by alcohol and drug use and other addictive behaviors. CASAA research is interdisciplinary, and attention to human diversity is integral to the research mission. CASAA investigators are committed to training students in research methods, and to
sharing knowledge with scientists, practitioners and individuals who are directly impacted by alcohol and drug use.

- **CASAA research breaks barriers between the University and the community** by addressing pressing problems in New Mexico related to alcohol and drugs, such as the costs of alcohol and drug use and crime, heroin and other opiate abuse, drinking and driving, alcohol use among Native Americans, and post-traumatic stress disorder among veterans.

- **CASAA researchers create connections** by collaborating with faculty in more than a dozen other departments within UNM, with more than a dozen colleges and community agencies within NM, with researchers across the United States, and with researchers in more than a half dozen other countries around the globe. These interdisciplinary partnerships address major problems in the alcohol and drug field, such as improving prevention and treatment; studying mechanisms of behavior change through the use of advanced techniques from cognitive neuroscience, psychology, and statistics; and addressing the unique needs related to alcohol and drug use of diverse populations such as Native Americans, Hispanics, adolescents, women, and criminal justice populations. CASAA integrates research with research training for pre- and post-doctoral fellows through institutional research funding from the National Institutes of Health.

- **CASAA:** Research to improve prevention, diagnosis, and intervention related to Fetal Alcohol Spectrum disorders and to more generally improve health outcomes for alcohol and drug using pregnant women and their babies; Research to understand the longitudinal course and processes of change in alcohol and drug use problems including changes in the brain, psychological functioning, and social relationships.

- **Center for High Technology Materials:** is committed to training the next generation of scientists, engineers, discoverers and entrepreneurs who can combine their technical training and critical thinking with excellent interpersonal and communication skills to become leaders of the 21st century. Our core strengths are: Research, creativity and innovation, interdisciplinary education, training and outreach, entrepreneurship and economic development. CHTM will continue to invent and discover disruptive technologies that can be scaled to develop innovative advanced manufacturing initiatives to create self-sustaining wealth based economies to leave the earth a better place than we found it.

- **Center for High Technology Materials:** Specific research topics include the epitaxial growth of compound semiconductor materials and devices, self-assembled quantum dots, quantum wells, nanowires, superlattices and lithographically-defined nanostructures, nanophotonics, doped and poled optical fibers, microring resonators and ultrafast optics, 2D materials and their structural, mechanical and electronic properties, application of 2D materials to flexible electronics, optoelectronics and photonics, rolled-up nanotech, bio-devices integration, materials for THz radiation, nano-scale magnetometry and MRI with
nitrogen-vacancy centers in diamond, and nanoscale thermal energy conversion. Device studies include near infrared, detectors and sources for datacomm and telecomm, avalanche photodiodes, semiconductor lasers, longer wavelength infrared sources and detectors, photovoltaics, nanofluidics, GaN-based visible and UV sources, solid-state lighting and high-efficiency LEDs, visible edge-emitting and vertical-cavity surface-emitting lasers, applications of group III-nitrides to energy efficiency and renewable energy, and novel readout-circuit concepts for smart-pixel imagers. Systems related research includes advanced optical lithography, interferometric lithography, spectral sensing and imaging, molecular imaging with optically-pumped fluorophores, vibrometry using synthetic-aperture radar, ultrafast optical receivers, and microscopy. Emerging areas of research include, Anderson localization and wave propagation in random media, plasmonics, metamaterials and metasystems in the broader context of classical, quantum and computational imaging.

- **Center for High Technology Materials:** The mission of CHTM is to create and sustain a culture of excellence to promote research and education in photonics, microelectronics and nanoscale materials and devices and their applications, foster interaction between UNM, federal laboratories, industry and promote an entrepreneurial spirit for economic development with a regional focus but of global importance.

- **Center for Micro-Engineered Materials:** Materials Science & Engineering: Functional nano-materials; Nano-materials for biomedical applications; Catalytic nano-materials; Materials Synthesis and Scale Up: aerosol processing and synthesis; colloidal synthesis and sol-gel synthesis methods; hydrothermal and pyrolytic synthesis of materials; Theory and Simulation of Materials: ab-initio calculations of materials properties; molecular dynamics approaches and simulations; materials processing; layers and coatings; multiphase flow and heterogeneous phenomena at solid/liquid interface; Materials characterization and evaluation: HR-TEM, TEM-EELS, SEM-XRD; FIB-SEM, XRD, SAXS, XPS, Confocal Raman Microscopy, etc.

- **Center for Micro-Engineered Materials:** UNM Center for Micro-Engineered Materials is a materials research institute that specializes nano-materials research based on chemistry and chemical engineering synthetic approaches. Area of currently funded research endeavors are as follows (only areas totaling of $1M/year expenditures or higher are listed): 1. Novel Materials For Energy Conversion & Storage: nano-structured non-PGM catalysts for HOR/HER and ORR/ORR as well as non-carbon fuel synthesis and utilization (ammonia, hydrazine), self-regenerating PGM catalysts for low temperature oxidation and hydrogen generation. 2. Materials and catalysts for bio-driven feed-stock conversion, utilization and valuation. 3. Bio-electrochemical Systems and Bio-inspired Catalysts: microbial fuel cells, electrolysers and water purification systems and adaptive catalysts cascades for deep oxidation of complex fuels. 4. Proto-cells: Mesoporous Materials for Drug Delivery and Therapeutics Advanced
Additive Manufacturing: technology platform based on 3D printing of functional nano-materials with feature controls at meso-scale and scale-up to macro-scale films and devices

- **Center for Micro-Engineered Materials:** Catalysis science including nano-stabilized noble metal and transition metal catalysts, electrocatalysts, and non-noble metal catalysts
- **Center for Micro-Engineered Materials:** Combined self-assembly, sol-gel, and biomimetic approaches to make new classes of biotic-abiotic materials with as yet unknown properties/phenotypes
- **Center for Micro-Engineered Materials:** Direct write technologies including 3D printing and printing of nanostructured inks along with modeling and simulation tools needed to predict and control printing
- **Center for Micro-Engineered Materials:** EDAC & SNL Cooperative Monitoring Center partnered in preparation for international arms control workshops. The workshops promote development of a friendly and working atmosphere between the two countries regarding removal of nuclear weapons from the border of countries. EDAC also assisted other international security groups within SNL to acquire imagery in a cooperative effort to improve security on the terminals, and has assisted on World Court cases concerning boundary disputes.
- **Center for Micro-Engineered Materials:** Membrane science based on combined molecular self-assembly, atomic layer deposition, and plasma processing which has resulted in ultra-thin membranes with unprecedented combinations of flux and separation efficiency
- **Center for Micro-Engineered Materials:** Nanoparticle based therapeutics based on so-called mesoporous silica nanoparticle for combatting cancer, rare diseases, and chemical and biological weapons
- **Center for Quantum Information and Control (CQuIC):** The Center for Quantum Information and Control (CQuIC) is a small, multi-investigator research unit in the College of Arts and Sciences. CQuIC has four core faculty at UNM, all in Physics and Astronomy, one core faculty member at the University of Arizona’s College of Optical Sciences, and about a dozen associate faculty at Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL). CQuIC has developed a unique experimental capability to control the quantum state of cold, trapped cesium atoms. We can create any state in the 16-dimensional ground manifold of atomic cesium, engineer any quantum-allowed transformation between states, and verify, using techniques of quantum tomography, the accuracy with which we have accomplished these tasks. CQuIC has pioneered the analysis of quantum limitations on the sensitivity of high-precision measurements, including nonlinear quantum interferometry, complete quantum limits on the noise added by nonlinear amplification, and critical analyses of so-called weak-value amplification and probabilistic quantum metrology. CQuIC has performed a seminal analysis of the quantum entanglement that is naturally present in the ground state of a quantum spin liquid phase or a symmetry-
protected topologically ordered phase and investigated the use of this entanglement as a resource for teleportation-based quantum computation. CQuIC has participated in fundamental experimental research that explores the limitations imposed by quantum mechanics on the ability to discriminate states that are used for optical communication, for the purpose of designing reliable and efficient communication channels.

- **Center for Water and the Environment**: Assisting state and local governments with financial implications of environmental service delivery and environmental compliance (this is through the Southwest Environmental Finance Center, which is within the CWE)

- **Center for Water and the Environment**: Water resources and watersheds, Treatment technologies for water and wastewater, including wastewater reuse; Assisting state and local governments with financial implications of environmental service delivery and environmental compliance (this is through the Southwest Environmental Finance Center, which is within the CWE); Factors affecting public perception of potable reuse. Our team is investigating: (1) the impacts of forest management on hydrologic processes in headwater watersheds, (2) the impacts of watershed management and wildland fires on nutrient processing rates, and (3) the interacting impacts between watershed management and climate change on hydrologic and biogeochemical processes in headwater watersheds. We are also conducting research to address urgent needs to protect the environment and public health and to increase water reuse through the development of technologies for water and wastewater treatment. Removal of contaminants are being improved through the development of novel technologies to ‘engineer’ biofilms through the design of attachment surfaces to enrich for beneficial microorganisms. We are conducting cutting-edge research on producing high quality water with minimal energy consumption through membrane distillation. We are also investigating how educational strategies and knowledge of potential treatment scenarios’ costs affect inland communities’ acceptance of planned potable reuse through a combination of focus groups and surveys. Additional research is on energy extraction process effects on water quality. We are investigating, for example, the potential for unintentional flow through the hydrofracking wellbore systems to contaminate overlying water-bearing zones. In-Situ Leach mining of Uranium not only mobilizes uranium but other constituents such as arsenic, chromium, molybdenum, selenium, and vanadium, which have the potential to contaminate aquifers. Our research focuses on the remediation of the contaminated groundwater, including removal or immobilization of the contaminants.

- **CETI - Center for Evolutionary and Theoretical Immunology**: Theoretical Immunology (CETI), centered in the UNM Biology Department, is the one NIH Centers of Biomedical Research Excellence (COBRE) program ever to be funded on UNM’s main campus. It is now in its third and final phase of the 15 year life cycle allowed for COBRE programs. CETI plays a major role in
supporting core facilities needed for cutting edge cell and molecular biology research, particularly including modern sequencing technology. Such core facilities are vitally important to maintaining UNM's standing as a division I research university. Major thematic research foci in CETI include comparative or evolutionary immunology, and parasitology (the study of eukaryotic disease organisms). CETI investigators have made fundamental contributions to theoretical aspects of immunology in collaboration with scientists in both the UNM Computer Science Department and the Los Alamos National Lab. Research areas include: evolutionary immunology including with both theoretical and practical implications; support of modern research facilities needed for many modern biological disciplines; parasitology/tropical parasitology/parasite diversity/disease ecology. Several more experimental and applied paradigm-shifting immunological studies on a spectrum of animals ranging from molluscs to fish to mammals have also emerged from CETI.

- **Cinematic Arts**: Cutting-edge research into the links between meditation, contemplation, and cinematic creativity.
- **Cinematic Arts**: Ground-breaking research in Virtual Reality and augmented reality that can be utilized by multiple industries such as architecture and planning, medicine, and gaming. Elan Colello’s research in virtual reality is breaking barriers in new knowledge and interdisciplinary research. He heads New Mexico’s first VR festival called the, “ARVRUS Roadshow.” Among his projects are 3D mapping robots and augmented reality for first responders. Colello also runs a VR outreach program sponsored by the FilmABQ office.
- **Cinematic Arts**: The creation of Metapipe: an online service enabling artists to create high-end visual effects and animation projects by utilizing a studio infrastructure based in the cloud. Faculty member Aaron Estrada is fostering creativity. His research in the fields of visual effects and animation has led to a breakthrough known as Metapipe. This online service is revolutionary because it allows animators and VFX artists to set up a powerful and complex studio infrastructure— including storage servers, render farm, even workstations—entirely in the cloud.
- **College of Education Multicultural Education Center**: Addressing the social, cultural, linguistic, and educational needs of students in grades k-12 from historically underrepresented populations.
- **Communication & Journalism**: Our department brings together scholars, creative artists and practitioners working in communication, mass communication and journalism; therefore our work bridges the social sciences, arts, humanities, and professional practice. We examine and produce a wide variety of scholarly texts, diverse multi/media products, documentaries, art forms, training manuals and instructional guides.
- **Communication & Journalism**: carries out research on the following questions: How does intercultural communication research and practice during community engagement challenge and change processes and conditions of social justice,
cultural advocacy, environmental justice and health for communities? How are intersecting cultural identifications and representations produced and consumed through media, public and private discourses and what are the ideological, material and power related consequences for groups, organizations and individuals? How does the use of various technologies and multimedia journalism forms impact health interventions, political engagement and relating across lines of difference?

- **Community and Regional Planning:** In urban and planning research, spaces of everyday life and work are active areas of scholarship. The CRP faculty conducts research on informal labor markets and spaces of informal work (Jennifer Tucker, Renia Ehrenfeucht; Claudia Isaac’s also work on food systems focuses on both food access and local agriculture) and affordable housing (Claudia Isaac, Ric Richardson; Renia Ehrenfeucht has also started a project in this area).

- **Computer Science:** Computation in the Large: high-performance and distributed computing, 'big data' and analytics, volunteer computing. Computation in the Large: Current large-scale computing systems enable unprecedented amounts of data to be stored and processed, with applications in national security and in the commercial realm. However, achieving optimal performance on these varied systems remains a challenge. At UNM CS, Prof. Patrick Bridges has worked on high-performance computing operating system and network software. Prof. Dorian Arnold has worked on middleware to support data analytics. Prof. Trilce Estrada has worked on Internet-scale volunteer computing systems. Prof. Abdullah Mueen has worked on data analysis algorithms for understanding social media and other applications.

- **Computer Science:** Cybersecurity: study of technical, ethical, and social aspects of computer and communication technology. Cybersecurity: As computers and communication networks increasingly permeate our built environment and drive our society, the technical and the societal issues in their design, deployment, and operation become ever more intertwined. At UNM CS, Prof. Jed Crandall has worked on technical aspects of network security, privacy, and censorship on the Internet. Prof. Stephanie Forrest has worked on bioinspired technical countermeasures, as well as security policy issues. Other contributors to the field have included Profs. Saia, Ackley, and Stefanovic.

- **COSMIAC:** Additive Manufacturing (AM) and Micro Dispensing (MD) - Working with NASA, UTEP and AFRL on 3D printing for space and high power RF applications.

- **COSMIAC:** COSMIAC is a School of Engineering Center of Excellence that focuses on Space and Directed Energy research. A considerable portion of our portfolio is in collaboration with AFRL. We have a lot of external partners that include National Aeronautics and Space Administration (NASA), Phillips Technology Institute (PTi), Maryland Aerospace Corporation (MAI), Stinger Ghaffarian Technologies (SGT), Silicon Space Technologies, Northrop Grumman, Wyle Corporation (under FILMSS), AEgis Technologies (under D3I),
XL Scientific, and DARPA. We collaborate with many partners on our CubeSat launches. We are synergistic with many sponsored programs in the ECE Department.

- **COSMIAC:** I have completed this survey as Director of COSMIAC and only focused on projects with research expenditures at COSMIAC. A very small portion of my own research flows through COSMIAC. The vast majority of my research is part of the Applied Electromagnetics group in the ECE Department, which I started when I came to UNM in 1989. In point of fact, if you look at the FY16 expenditures in the School of Engineering, if you combine the research expenditures of Applied Electromagnetics Faculty in the ECE Department (we are 5 tenure stream faculty) with the research expenditures of COSMIAC, that totals 20% of the research expenditures for the entire School of Engineering, which comprises 99 faculty. This is an important story to tell.

- **COSMIAC:** Radiation Testing in Collaboration with AFRL - For NASA Ames and SpaceX

- **COSMIAC:** SORTIE: COSMIAC’s 2nd 6U Satellite

- **COSMIAC:** W/V Band Propagation for NASA

- **Earth Data Analysis Center:** Applied Research & Services since 1964; 100% self-sustaining, provides UNM with revenue and partnerships opportunities;

- **Earth Data Analysis Center:** As the primary contractor to NM Department of Information Technology, EDAC received a four-year award in support of broadband services, this was a vital part of the National Telecommunications & Information Administration’s, which helps to expand NM’s broadband access to communities lacking quality Internet service. EDAC supports the broadband efforts by providing a skilled team of geographic information system professionals, while leveraging investments NM has made in the Resource Geographic Information System (RGIS) program. The project objectives: acquire, process and analyze, model, report, and map Internet Service Provider data via interactive Web mapping application for broadband and IT services through the life-cycle of the project (nmbbmapping.org).

- **Earth Data Analysis Center:** EDAC serves as a broker between UNM’s academic units and the external communities we serve; to facilitate and stimulate collaborations between government agencies, between government and private organizations, and between universities in the region. As a Center of excellence in the GI-sciences for UNM and the State, EDAC is a well-known among Federal agencies, state, local and tribal governments, and professional societies, organizations and advisory bodies nationally and internationally. Our mission is to serve the needs of these communities by employing GI-science and technologies to retrieve, disseminate, process, and analyze remotely acquired analog and digital data relating to Earth’s physical, cultural, and biological resources; with these assets, to undertake basic and applied research, technical assistance, and training activities for the public and private sectors of NM, while
strengthening student education to meet increasingly complex resource management and decision needs.

- **Earth Data Analysis Center**: EPSCoR Cyberinfrastructure: suite of services, tools, people, equipment & software connecting researchers, educators, computers, and data that facilitate collaboration and enable the generation of new knowledge beyond what any one individual could do alone. Built and housed at EDAC.

- **Earth Data Analysis Center**: Geospatial Data and Technologies—GIS/Photo/Satellite/Lidar Data Processing, Analysis, Modeling, Mapping, and Web Applications: NM National Hydrography Database; FEMA Cooperating Technical Partner for the State of New Mexico; emergency response/disaster preparedness; habitat, wildfire, flood studies.

- **Earth Data Analysis Center**: Network of research-based technology & systems; open access to geospatial data; statewide and national collaborative development of geospatial resources, methods, and standards; serves public, industry, education, government; Historic Aerial Photo (1930-present) & Satellite Archives.

- **Earth Data Analysis Center**: NM Geospatial Advisory Committee-Elevation Data Planning and Acquisition Subcommittee: EDAC leads NM’s statewide high-resolution elevation/lidar data acquisition, analysis and modeling, and facilitate data partnerships and collaborations across local, state, and federal agencies and organizations.

- **Earth Data Analysis Center**: Work with NM NSF EPSCoR, contributing to the development of successful EPSCoR proposals worth 25M$ supporting research projects and related cyberinfrastructure development in NM and collaborative research and infrastructure development between NM, NV and ID. EDAC leads the development of data management & virtual watershed components, contributing to data & model output visualization capabilities, with Dr. Karl Benedict.

- **Economics**: The department of economics has a long history of research strength in environmental, resource and ecological economics, including work in sustainable development. In the late 1960’s we began offering one of the first economics graduate program specializations in this area. The bulk of our research grants and publications each year tend to happen in this area, where we have produced numerous PhD graduates. We have regularly placed high in international and national rankings in this area. The numerous topics investigated include: climate change, biodiversity, endangered species, hazardous waste, water resources, river system management, ranch lands management, wildfire and forest restoration, agricultural pollution, energy economics, etc. Research applications include; dynamic modeling, econometrics, and simulations. As well, we have strengths in non-market valuation and primary data collection, including surveys and experimental economics. We continue to have at least 6 faculty with
primary foci in this area. This is complemented with growing strengths in public and health economics, and development and sustainability.

- **Economics:** As the primary contractor to the NM Department of Homeland Security & Emergency Management, we partner with State & Federal agencies, local communities, tribal entities, and professional associations to support the coordination, planning, and development of NM floodplain mapping. Our geospatial support services are vital to NMDHSEM’s assessment, response and recovery efforts.

- **EPSCoR/DataONE:** Data Observation Network for Earth (DataONE) is the foundation of new innovative environmental science through a distributed framework and sustainable cyberinfrastructure that meets the needs of science and society for open, persistent, robust, and secure access to well-described and easily discovered Earth observational data. Supported by the U.S. National Science Foundation (Phase 1 Grant #ACI-0830944, Phase 2 Grant #ACI-1430508) as one of the initial DataNets, DataONE will ensure the preservation, access, use and reuse of multi-scale, multi-discipline, and multi-national science data via three primary cyberinfrastructure elements and a broad education and outreach program.

- **EPSCoR/DataONE:** Energize New Mexico focuses on one overarching question that has great potential to transform the research enterprise in New Mexico and to promote sustainable development: How can New Mexico realize its energy development potential in a sustainable manner? This question encompasses two interrelated components: How can the efficiency of resource utilization or extractive technologies be increased? This question focuses on use-inspired fundamental research in the areas of bioalgal fuels, solar energy, and osmotic power production from oil and gas industry produced waters. Can we sustain extractive energy development with no or minimal risk to water and environmental resources? This question focuses on geothermal energy development, uranium mining and environmental remediation, and the social/science nexus that includes dynamic systems modeling and understanding factors that affect human choice and decision-making.

- **EPSCoR/DataONE:** Environmental Informatics: promoting discovery, access, use, and sharing of environmental data via a federation of data repositories globally and the provision of data management tools and a suite of repository services.

- **EPSCoR/DataONE:** New Mexico’s Experimental Program to Stimulate Competitive Research (NM EPSCoR) is funded by the National Science Foundation (NSF) to build the state’s capacity to conduct scientific research. Faculty and students from NM universities and colleges are working to realize New Mexico’s potential for sustainable energy development. NM EPSCoR is also cultivating a diverse, well-qualified Science, Technology, Engineering and Mathematics (STEM) workforce and supporting a culture of innovation and entrepreneurship.
- **Foreign Languages and Literatures**: Applied Linguistics and Second Language Acquisition Pedagogy
- **Foreign Languages and Literatures**: Cutting edge research on language acquisition/pedagogy and study abroad.
- **Geography & Environmental Studies**: Finally, a number of our faculty engage in more humanistic studies in collaboration with the newly formed Spatial Humanities Working Group. This work intersects with Latin American Studies, History, and Anthropology, with a particular emphasis on the past environments of the Americas.
- **Geography & Environmental Studies**: In addition, we have a very significant area of faculty expertise in research studying Socio-Ecological Systems and Resilience at a variety of scales -- from the national and regional to the watershed and community levels. We engage with faculty in a variety of other departments to undertake large, interdisciplinary projects in this area.
- **Geography & Environmental Studies**: We are one of very few Geography departments to boast a specialization in Legal Geography, and our faculty members with this expertise engage with colleagues in CRP and with community groups to undertake significant collaborative projects that focus on spatial justice.
- **Geography & Environmental Studies**: We have a significant expertise in Geospatial Technologies including remote sensing, GIS, and spatial modeling for both environmental applications (e.g. modeling the movement of ecosystem boundaries in response to climate change and other pressures) as well as urban applications (e.g. improving algorithms for remotely detecting change in infrastructure conditions after a natural hazard). This work involves collaborations not only within the department but also with a variety of other departments on and off campus.
- **Geography & Environmental Studies**: We have an emerging expertise in health geographies, which intersects strongly with our expertise in Geospatial Technologies, as we use GIS and spatial modeling to identify/analyze disparities in health outcomes and to evaluate environmental health risks that vary from place to place.
- **History**: A final area that has recently been reinvigorated is the History of Science, Technology, Medicine, and the Environment (HSTEM) with 3 hires, two in History of Medicine and one in History of Science.
- **History**: An emergent area of excellence is medieval history with three of our four faculty serving on the boards of the Medieval Academy and editorial boards. At present, they are among the most prolific publishers of research in the department.
- **History**: The Department’s areas of excellence are Latin American history, the American West, and Comparative Women’s and Gender History. These areas of strength have been recognized by the university by the awarding of three distinguished professorships in these areas. Latin American and Iberian History faculty contribute to a number of university-wide programs, including the LAII.
• **Honors College**: Mobile game design used in curricula and diagnostics for topics ranging from language learning to ecology, undertaken by Chris Holden, a well-known national leader for inquiry into mobile learning experiences and a primary developer for ARIS, an open source, augmented reality, game design platform.

• **Honors College**: Research on the pedagogy of human rights in higher education undertaken by Sarita Cargas who has been invited to present her at international conferences and been contracted by a major press to produce a book detailing how higher education should approach teaching human rights as a discipline.

• **Institute of Meteoritics**: NASA space missions of solar system exploration. For example, we currently participate in the Mars Science Lab mission and are involved in the upcoming Mars 2020 mission. IOM is a premier research institution for study of early solar system and planetary evolution. Founded in 1944, the IOM was one of the first institutions in the world devoted to the study of meteorites. Research in the IOM focuses on a wide variety of extraterrestrial materials and takes advantage of state-of-the-art laboratory facilities housed within IOM and the Department of Earth and Planetary Sciences. The IOM meteorite collection now totals more than 1000 different meteorites, and is an extremely valuable asset for researchers worldwide. The mission of COMPRES, on behalf of its community of member institutions, is to enable Earth Science researchers to conduct the next generation of high-pressure science on world-class equipment and facilities, to facilitate the operation of beamlines and use of high-pressure Earth sciences facilities at national laboratories, to develop new technologies for high-pressure research, and to advocate for science and educational programs.

• **International Studies Institute**: Presentation of public lectures on International affairs and international planning by distinguished faculty in the US and abroad; literature, art, and cultural studies; Conference on Cultures of Exile: Conversation on Language and the Arts, October 2013.

• **Landscape Architecture**: Landscape and Infrastructure, Urban Design. The Landscape Architecture program has been engaged in research and design for alternative storm water management in the Albuquerque region. We have worked with AMAFCA to re-imagine landscapes off urban storm water detention and re-distribution. We have also done work with projects that engage the idea of the ephemeral landscape. Ideas of temporality and ephemerality have crept into the discourses of public art and landscape architecture. In exploring the role of ephemeral, transitory space, and its expression, we help to concentrate our understanding of the issues, ideas and processes of public life.

• **Language Literacy and Sociocultural Studies**: Our Department has a rich history of research with communities. We are involved in understanding areas as intense and bounded as eye movements during reading and as broad as understanding the ways in which language, culture and power are related. We have research sites in after school programs related to STEM with middle school
children and professional development projects rooted in maintaining Indigenous languages. We also research Literacy, Reading and Writing, Digital Texts

- **Language Literacy and Sociocultural Studies:** We have a sustained and positive effort in securing funding for Indigenous language learning and maintenance. The eye movement research involves understanding the psycholinguistics of reading. Our connections to teachers, schools and communities is essential and ongoing with a history of very impactful work."

- **Linguistics:** UNM faculty are experts in providing support to communities engaged in reversing the trend of threatened or dying languages

- **Manufacturing Engineering Program:** The Mfgr Engr Prog (MEP) has had NSF ATE SCME grant funding for 8 years and $6.8M ($8.6M total with TVI/CNM components). And, the MEP had $1.4M of NSF ATE Cross-Training funding from 1998-2003 (for a total of $10M of NSF ATE funding).

- **Marketing, Information Systems, & Decision Sciences:** Online consumer surveys. Dr Catherine Roster has partnered with Dr. Gerald Albaum as well as scholars at other United States Universities in the area of online survey methodology. Consumer surveys are increasingly being delivered online. Online consumer surveys present both opportunities as well as unique challenges.

- **Marketing, Information Systems, & Decision Sciences:** 3D Virtual modeling. Dr. Nick Flor has developed software for modeling 3D virtual worlds with applications to work being done in a National Science Foundation grant on solar photovoltaics. Dr. Flor is a co-principal investigator with faculty in the school of engineering. The 3D apps are designed to provide interactive visualizations for the general public.

- **Marketing, Information Systems, & Decision Sciences:** Decision Support Systems, Information & Management, Computers in Human Behavior, & Data Base Management. Dr. Xin (Robert) Luo has published 25 peer reviewed journal articles in these areas. He works with both department faculty and international scholars. He has orchestrated the visits of numerous scholars from China. Area of Excellence

- **Materials Center for High Technology Materials:** CHTM is committed to training the next generation of scientists, engineers, discoverers and entrepreneurs who can combine their technical training and critical thinking with excellent interpersonal and communication skills to become leaders of the 21st century. Our core strengths are: Research, creativity and innovation, interdisciplinary education, training and outreach, entrepreneurship and economic development. CHTM will continue to invent and discover disruptive technologies that can be scaled to develop innovative advanced manufacturing initiatives to create self-sustaining wealth based economies to leave the earth a better place than we found it.

- **Materials Center for High Technology Materials:** Specific research topics include the epitaxial growth of compound semiconductor materials and devices, self-assembled quantum dots, quantum wells, nanowires, superlattices and
lithographically-defined nanostructures, nanophotonics, doped and poled optical fibers, microring resonators and ultrafast optics, 2D materials and their structural, mechanical and electronic properties, application of 2D materials to flexible electronics, optoelectronics and photonics, rolled-up nanotech, bio-devices integration, materials for THz radiation, nano-scale magnetometry and MRI with nitrogen-vacancy centers in diamond, and nanoscale thermal energy conversion. Device studies include near infrared, detectors and sources for datacomm and telecomm, avalanche photodiodes, semiconductor lasers, longer wavelength infrared sources and detectors, photovoltaics, nanofluidics, GaN-based visible and UV sources, solid-state lighting and high-efficiency LEDs, visible edge-emitting and vertical-cavity surface-emitting lasers, applications of group III-nitrides to energy efficiency and renewable energy, and novel readout-circuit concepts for smart-pixel imagers. Systems related research includes advanced optical lithography, interferometric lithography, spectral sensing and imaging, molecular imaging with optically-pumped fluorophores, vibrometry using synthetic-aperture radar, ultrafast optical receivers, and microscopy. Emerging areas of research include, Anderson localization and wave propagation in random media, plasmonics, metamaterials and metasystems in the broader context of classical, quantum and computational imaging.

- **Maxwell Museum of Anthropology**: As examples of the range of research conducted at the Museum, our Curator of Osteology is an expert on dental variability in prehistoric and modern regional populations, while our Curator of Ethnology recently hosted ten Native American artists in a week-long study of the artistic aspects of items collected from Chaco Canyon.

- **Maxwell Museum of Anthropology**: Incorporation of existing or newly acquired research collections at the museum

- **Maxwell Museum of Anthropology**: The Museum’s efforts supplement the work of the Department of Anthropology, but we differ from that academic unit in two important ways. First, our work is based on the creation and maintenance of research collections for use by students and established scholars from UNM and elsewhere -- not excluding our own staff.

- **Maxwell Museum of Anthropology**: Second, we not only support student learning and scholarly research, we also consistently provide programming for the general public (K-12 and adult). As such, we are part of the public face of UNM’s research efforts.

- **Maxwell Museum of Anthropology**: Finally, it is important for UNM to have ways to convince the general public that the research we do is important and interesting and worthy of their political and financial support. The Museum helps transmit that message.

- **Maxwell Museum of Anthropology**: The Office of Contract Archaeology (OCA), which is administratively attached to the Maxwell Museum, provides archaeological and related professional services to public agencies and private
clients on a contract research basis. OCA thus provides a full-time, year-round program of research into New Mexico's prehistory and history.

- **Mechanical Engineering:** Energy systems and sustainability; Multiscale mechanics of materials and fluids; Dynamics and control of robotic and complex systems; Research expertise in the Department of Mechanical Engineering spans the wide areas of thermal science, heat transfer, manufacturing & automation, materials science, engineering design, dynamic systems/controls, fluid mechanics, and computational mechanics.

- **Mechanical Engineering:** Faculty and students are increasingly engaged in interdisciplinary researches in energy, micro- and nanotechnology, and bio-engineering. Areas of distinction include integrative energy systems, multiscale mechanics of materials and fluids, and dynamic systems and control, as evidenced by recent publications in top-notch journals such as Nature Communications and Scientific Reports.

- **Museum of Southwestern Biology:** Comparative genomics of non-model organisms to include understanding the genomics of adaptation (to altitude, aridity, etc), genomic signatures of coevolution (e.g., host-parasite), and genomics of speciation, diversification and hybridization.

- **Museum of Southwestern Biology:** Environmental informatics: spatial and temporal studies of biodiversity on our changing Earth.

- **Museum of Southwestern Biology:** Identification and dynamics of emerging zoonotic and wildlife pathogens.

- **Museum of Southwestern Biology:** International organizations rely on our specimens, data and expertise to help them design and implement initiatives. MSB has built a strong reputation in the public health arena related to identifying and understanding the ecology of zoonotic diseases (e.g., hantavirus) in the western US, but also in international settings including Latin America and Asia. Because of vast spatial and temporal biodiversity data served, MSB is a key player in national and international efforts in bioinformatics, both environmental and genomic. Our activity is recorded in the number of database hits (and downloads), loans, and publications.

- **Museum of Southwestern Biology:** Investigating terrestrial and aquatic community dynamics in response to changing climates and environments.

- **Museum of Southwestern Biology:** Systematics, phylogeography, ecology and conservation of organismal diversity based on morphological, genetic and isotopic investigations.

- **Museum of Southwestern Biology:** The Museum of Southwestern Biology (MSB) provides critical infrastructure to a world-wide community of scientists, educators, public health workers, and natural resource managers by providing collections (samples) and web-accessible databases that constitute an informatics resource for understanding the complexity of planetary life and related ecosystem function on local, regional, and global scales and across time. High research activity at MSB demonstrates the increasing use of collections
(both samples and data) in environmental and biomedical research. Our collections support a tremendous number of peer-reviewed publications (nearly 200 in 2015) and attract significant grant dollars. Two collections are world-class (Mammals and Genomic Resources) and six others are the largest regional collections for the SW.

- **Music**: The internationally known John Donald Robb Composers’ Symposium has brought composers and musicians from around the world to UNM for a series of public concerts and unique learning opportunities for UNM students.

- **Office of Contract Archeology**: The specialists utilized in our research include several in-house staff (for stone tool analyses, ceramic analyses, faunal analyses and GIS work) and a broad range of outside consultants and laboratories from outside universities and in the private sector – both country-wide and, in some cases, world-wide. The several projects listed in our current Areas of Research Excellence represent high profile themes in archaeological research.

- **Peace Studies** has numerous researchable issues waiting for academic research would draw interest for cooperation from the Carter Center in Atlanta, university ties with Sweden, Norway, South Africa and the Kroc Institute, University of Notre Dame. Added value comes from an association with a leading scholarly journal such as the Journal of Peace Research.

- **Peace Studies**: Application of peacemaking through research contributes to the discourse between academia and actual ethical decision making via problem-solving workshops and research seminars.

- **Peace Studies**: Connecting cross-disciplinary research supports the further development of integrative thought. Most recently, the program participated in UNM’s DK2-Data to Knowledge Interdisciplinary Research Symposium it which the program director presented on contributions to reducing risks of infectious diseases at the animal-human-ecosystems interface. This strategic framework addressed priority actions, specific objectives and outputs, cross-cutting and institutional issues. Noting that violence is a public health issue the program takes on research, policy, and practice in strategic peacebuilding education that promotes global health and health equity.

- **Peace Studies**: Lastly, peace research agendas are also supported by its participation and partnering with the U.S. State Department’s Diplomacy Lab initiatives in which it explores the contexts of working in ‘critical policy analysis.’

- **Peace Studies**: Making peace research at UNM means allowing a new milieu and tradition to emerge especially when new concepts about health and human security are developing. Moreover, it needs protection from skeptics and political pressures.

- **Peace Studies**: Peace research agenda to prevent and reduce violence-related health inequities including structural violence, gender and children, community, society, and research gaps in systematic reviews, interventions, and program evaluation.
• **Physics and Astronomy:** The Physics and Astronomy department has major research activities in astrophysics, optical science and photonics, quantum information science, and subatomic physics, with smaller efforts in biomedical physics. Highlights of our astrophysical research are the development and use of radio telescopes to study the universe. The department’s biophysics group develops microscopic techniques with resolution below the far-field diffraction limit, and with collaborators from the life sciences, studies fundamental processes in cells. Pioneering work of our quantum information group investigates how quantum physics can advance computing, communication and control of complex processes. Researchers from the particle physics group are involved in the searches for dark matter, the study of subatomic particles and cosmic radiation. Groundbreaking research efforts of the optics group target imaging and spectroscopy, the development and application of novel laser sources, and optical cooling of solids.

• **Physics and Astronomy:** The Physics and Astronomy department has major research activities in astrophysics, optical science and photonics, quantum information science, and subatomic physics, with smaller efforts in biomedical physics. These areas take advantage of opportunities for cross-cutting, interdisciplinary research, with other units at UNM, with the nearby federal laboratories and other universities as well as in large international collaborations.


• **Psychology Department:** Clinical Neuroscience: fundamental features of cognition, brain, & behavior (both cognitive & behavioral neuroscience). Clinical Neuroscience: We have a new Psychological Clinical Neuroscience Center that houses a variety of unique research projects. A few examples include tDCS projects to improve attention and learning, EEG signatures of frontal cortical function, and studies to refine the neuro-developmental model of obsessive compulsive disorder.

• **Psychology Department:** Evolutionary Psychology: mate choice, ovulatory cycle effects, hormonal influences, and social influences on pain. Evolutionary Psychology: Our department has an excellent program, in part due to the collaborations with other UNM departments (biology, anthropology). Our researchers study such topics as health related behavior (as informed by Evolutionary Psychology), genotype-environment interactions, prenatal development, early social development, self-regulation, evolutionary models of
mental disorders, individual differences in stress responsivity, mutual mate choice, ovulatory cycle effects, and intelligence - just to name a few topics.

- **Psychology Department:** Treatment for Problems with Alcohol and Drugs.
  Treatment for Problems with Alcohol and Drugs: We have several faculty within the department who study various aspects of this problem. For example, we have an animal researcher who examines the long-term consequences of exposure to alcohol during prenatal development on learning, memory, and social behavior. We have neuroscientists who study whether transcranial direct current stimulation (tDCS) improves smoking cessation programs. Additionally, our faculty are interested in mindfulness-based relapse prevention, the application of treatments to homeless women, and psychological treatments for opiate problems. We have several faculty with part-time appointments at CASAA as well, and these individuals study cultural adaptations of alcohol or drug treatments, self-help programs, and behavioral couple therapy. We also have a researcher who examines the role of alcohol in sexual re-victimization.

- **Spanish & Portuguese:** The Hispanic Linguistics faculty carry out research on language varieties and language change, with a particular emphasis on language contact. Areas of focus include bilingualism, phonetics and phonology, language acquisition, historical change, heritage language, grammar and grammaticalization. This research is relevant to language policy and language acquisition.

- **Speech & Hearing Sciences:** Bilingualism - clinical applications for screening, assessment, and intervention; augmentative and alternative communication (AAC); efficacy of transcranial direct current stimulation brain injury; stuttering disorders speech intelligibility, and swallowing and voice disorders. Our faculty are engaged in research activities, some with external funding and others without, that aim to improve the outcomes for individuals with a variety of communication and swallowing disorders.

- **The Utton Center** is the only center in the State focused on water law. It has developed distinctive expertise in environmental, agricultural and Native American water rights.

- **Theatre and Dance:** Evaluation criteria - Professional publication history by Ph.D. faculty; National/International Faculty productions; Faculty research in classroom, studios and productions, developing; Works performed locally with instances of national and international exposure; Historic works re-created and staged at the Joyce Theatre, and Lincoln Center, NYC and world-wide touring by the Martha Graham Dance Company; Collaboration and transmission of historic works commissioned by national centers for dance and choreography and national conservatory for dance, Paris and Angers, France; Faculty presentations at ITI sponsored by UNESCO.

- **UNM Center for Advanced Research Computing:** Computational analysis of bioinformatics data; Psychological and Medical Data Analysis; Computational Physics and Engineering; Measuring Internet Censorship and Surveillance
UNM Center for Advanced Research Computing: UNM CARC-affiliated researchers conduct broad array of outstanding research whose common theme is being enabled by large-scale computation and computational data analysis. This research is highly interdisciplinary, encompassing a wide range of fields across the University. While the predominant work in this area is in fields such as biology, physics, medicine, computer science, and various engineering disciplines, the social sciences, including economic and anthropology are an emerging area, where high-end computation is making growing contributions which could have significant societal impact. In addition, research in this area is strongly tied to the local and regional research institutes, such as the DOE national labs and the Santa Fe Institute are also key elements of this research.

Breaking Barriers Between Communities And The Academy In Community Engaged Research.

• Art and Art History: Friends of Orphan Signs grew out of a seminar taught by Ellen Babcock about repair as an activity and strategy for artists that raised questions about history, appropriation, and relationships between creative construction and decay. The collective of artists generates artwork for abandoned city signs by working collaboratively with the public at large, especially those connected locally to the space and visibility of the signs. Their objectives are to keep open the possibility for a non-commercial, stylistically hybrid, and changing voice of collective origin and bring humor and surprise to the visual landscape of Albuquerque.

• Cinematic Arts: Professor Adan Avalos’ breaks barriers to underrepresented populations and promotes diversity in academic research. He has been invited to discuss his research, documentary productions, and experiences as a migrant worker at the International Native and American Congress taking place in Veracruz, Mexico in June. This annual gathering brings together a collective of national and international indigenous leaders and community members working on preservation, education, and organization of indigenous rights.

• Cinematic Arts: The production of experimental films and cutting-edge curatorial practice that brings together UNM, New Mexico, and international communities. Bryan Konefsky epitomizes the community-based researcher. Last year, Konefsky’s art collective Basement Films were invited to be artists in residence at the Center for Contemporary Art in Santa Fe (UNM students assisted in staging the gallery exhibit and workshop that were part of the residency). Konefsky’s participation in the International Festival of New Latin American Cinema in Havana has inspired a Cuban focus the 2017 iteration of his Experiments in Cinema festival.

• College of Education Multicultural Education Center: The range of projects we house, some funded others unfunded, prove excellent and distinctive in that we work in and with the communities we serve. For instance, Academic Literacy
for All (ALA), Dr. Holbrook Mahn PI, aims to enhance the educational experiences of English language learners (ELLs) through critical pedagogy and dialogue. The program promotes a methodological approach that teachers and language practitioners can use to increase students’ access to rich academic language development in the core content areas. In another example, we host an annual STEAM-H Community Learning Academy (CLA) in collaboration with the UNM Health Sciences Center (HSC) that supports teachers, parents, and other stakeholders in promoting STEAM-H teaching and learning and career paths among New Mexico’s k-12 student population.

• **College of Education Multicultural Education Center:** We are a small, category II center. Although small in comparison to others, our impact is meaningful because our work is grounded in community collaboration and service, and from this perspective serves a great purpose that although not measurable by the funds we attract, is still of critical import. This is especially true as the demographics of our nation become increasingly diverse.

• **Communication & Journalism:** Another characteristic of our work is that we are committed to involving community members in collaborative projects to ensure that they benefit from the research or creative activity, notably in the arenas of advocacy for identity groups, health, and political engagement.

• **Community and Regional Planning:** Food and water systems planning: CRP faculty blend the boundaries of basic and applied research and engaged scholarship in numerous projects that investigate the potential for systemic transformation in water use and reuse and local food systems.

• **Community and Regional Planning:** Other faculty members are engaged with research and other scholarship on water and food system transformation while simultaneously using this knowledge to contribute to New Mexico’s transformation through engaged scholarship including participatory evaluation research and applied research, as well as professional service (Claudia Isaac, Caroline Scruggs, and Bill Fleming).

• **Community and Regional Planning:** Scholarship from the CRP faculty crosses boundaries among basic research, applied research and engaged scholarship. Research projects in CRP simultaneously investigate the forces driving contemporary community and regional change and how different types of interventions influence how places change, while engaging with communities, public and private stakeholders and others who are actively working for just and environmentally sustainable outcomes.

• **Geography & Environmental Studies:** We are one of very few Geography departments to boast a specialization in Legal Geography, and our faculty members with this expertise engage with colleagues in CRP and with community groups to undertake significant collaborative projects that focus on spatial justice.

• **Language Literacy and Sociocultural Studies:** We have a sustained and positive effort in securing funding for Indigenous language learning and maintenance. The eye movement research involves understanding the
psycholinguistics of reading. Our connections to teachers, schools and communities is essential and ongoing with a history of very impactful work.

- **Linguistics:** Language revitalization and documentation - Linguistics faculty work with minority communities to preserve cultural identity and indigenous language practices.

- **Linguistics:** Signed languages are the primary languages of Deaf communities - how are these languages similar to and different from spoken languages? How can signed language research reverse the marginalization of deaf individuals? Community engaged research on indigenous signed and spoken languages breaks down barriers between these communities and the academy, and fosters diversity in the academy by creating research emphases that are relevant to minority communities.

- **Political Science:** Political Science excels in research on Campaigns and Elections.

- **Theatre and Dance:** Dance program, only undergraduate and graduate degree with a Flamenco Concentration in the world, noted by the Chairperson of the NEA (2016) as strong example of NEA goals of cultural preservation, transmission and rigor.

- **Theatre and Dance:** Embodied Dance History Studies integrated into student experiences, partnerships with: American Dance Legacy Initiative / Brown University, Martha Graham Dance Company, Two NEA funded Masterworks reconstructions and preservation projects

- **UNM Art Museum:** UNM Art Museum 50th Anniversary Catalog. Essays by Lisa Tamiris Becker and Michele Penhall. A survey of the museum’s permanent collection and history. Stories from the Camera catalog. Edited by Michele Penhall and features essays by former/current UNM photography faculty and staff. Melanie Yazzie: Geographies of Memory exhibition catalog. Essays by Lisa Tamiris Becker and Lucy Lippard. The UNAM presents exhibitions and publications produced in house or brought in from other museums. The publications highlighted above were each produced in the past two years by the museum and accompanied exhibitions. The UNAM is a teaching museum and we seek to serve the entire University community. UNAM is a public interface for the research that occurs at UNM. To date this year 2,812 people have visited the museum. I just started as director in August and am actively pursuing collaborations/engagements with departments across UNM.

Breaking Barriers To Underrepresented Populations And Topics To Promote Diversity In Academic Research.

- **American Studies:** scholarship related to migration, borders, and race/ethnicity: Native & Indigenous Studies: Our faculty and students are engaged in local, regional and transnational indigenous studies, with a particular focus on the history, legacy, and contemporary manifestations of colonialism. One area of
research that has been especially productive in our unit is a focus on Native American poverty in Albuquerque and Gallup, NM.

- **CASAA**: Research to improve outcomes for persons with alcohol and drug problems by developing and testing novel treatments, researching methods to train clinicians, and testing adaptations diverse populations such as Native Americans, Hispanics, adolescents, women, and criminal justice populations. Research to better understand and to test methods to prevent harm from alcohol and drug use as well as other risky behaviors in diverse populations, e.g., drinking and driving; college student use of alcohol, tobacco, and other drugs; and college student vulnerability to sexual victimization.

- **Cinematic Arts**: Investigations relating to border art and the Chicano avant-garde. A socially engaged cinematic scholarship that promotes diversity and underrepresented imagery.

- **College of Education Multicultural Education Center**: Currently, we are working with Dr. Melanie Moses (PI, Computer Science) on the project, Computer Science for All (CSforAll) to increase the presence and learning outcomes of underrepresented student populations in the field of Computer Science.

- **Communication and Journalism**: carries out research on questions including: How do post/anti-colonial critical approaches enable analysis of transnational, national, regional and local political, cultural and social relations around such processes as multiculturalism, neoliberalism, racial hierarchization and heteronormativity? How are cultures of indigenous, Southwest, and Global South (such as Central America, Latin America and Africa) and Europe shaped, challenged and/or valorized through visual communication, discourse and media?

- **Community and Regional Planning**: Indigenous planning: CRP faculty are globally recognized scholars that have spearheaded both action and research in Indigenous planning including exploring issues surrounding community change, art and work, radical sovereignty, violence and safety. Everyday urbanisms; CRP faculty investigate the forces shaping landscapes of informal work, affordable housing, public spaces and New Mexican traditional communities.

- **English Department**: In Rhetoric and Writing, our faculty is upcoming, as the group is assistant professor heavy, but most of them are publishing ferociously on issues surrounding language use, English as a Second Language, etc.

- **History**: The reputation of the Department in terms of its study of the American West (including a concentration in Native American history) has been well established for many decades.

- **Honors College**: Role of sport and athletics in American history, particularly in the context of civil rights, investigated by Ryan Swanson, who has earned an impressive national reputation for his research on baseball history as well as the Society for American Baseball Research Award since coming to UNM in 2013.
• **Linguistics:** Language revitalization and documentation - Linguistics faculty work with minority communities to preserve cultural identity and indigenous language practices. Research on signed languages, which are the primary languages of Deaf communities.

• **Political Science:** Political Science excels in the areas of Campaigns and Elections, Minority Politics and Race, Global Politics and Policy: Conflict, Human Rights, and Latin America, Gender Politics and Women’s Rights, and Health Policy.

• **Speech & Hearing Sciences:** Bilingualism - clinical applications for screening, assessment, and intervention. Our faculty are using cutting-edge technologies and addressing important contemporary basic and applied science questions with a special emphasis on issues of cultural, linguistic, and socioeconomic diversity.

• **Spanish & Portuguese:** Several themes cross departmental research, including genre and period studies; border contact; race, gender, and ethnicity; violence and human rights; colonial studies; film; performance; and indigenous studies.

Breaking Barriers In Expression By Fostering Creativity, Performance And Novelty.

• **Art and Art History:** Border to Baghdad is an online exchange created by UNM faculty and artist Szju-Han Ho and a colleague at the SADA Contemporary Art Center in Baghdad, Iraq. It aims to create an exchange between artists from the U.S.-Mexico border and Iraq. The project engages students and artists through exchange of information, images and ideas and centers around the medium of the score, or set of instructions for making an artwork, that each group wrote for the other and ultimately performed and shared the results.

• **Cinematic Arts:** The creation of Metapipe: an online service enabling artists to create high-end visual effects and animation projects by utilizing a studio infrastructure based in the cloud. Faculty member Aaron Estrada is fostering creativity. His research in the fields of visual effects and animation has led to a breakthrough known as Metapipe. This online service is revolutionary because it allows animators and VFX artists to set up a powerful and complex studio infrastructure -- including storage servers, render farm, even workstations -- entirely in the cloud.

• **Communication & Journalism:** Our department brings together scholars, creative artists and practitioners working in communication, mass communication and journalism; therefore our work bridges the social sciences, arts, humanities, and professional practice. We examine and produce a wide variety of scholarly texts, diverse multi/media products, documentaries, art forms, training manuals and instructional guides.

• **COSMIAC:** Biology Work with NASA Ames and UNM Biology Department COSMIAC Biology Faculty are launching yeast samples into deep space - coordinating activities between UNM Biologist and NASA Ames
• **English Department:** Creative Writing. The Creative Writing program has some heavy hitters in the publication arena, some of whom have more than 10 books published.

• **Materials Center for High Technology Materials:** CHTM is committed to training the next generation of scientists, engineers, discoverers and entrepreneurs who can combine their technical training and critical thinking with excellent interpersonal and communication skills to become leaders of the 21st century. Our core strengths are: Research, creativity and innovation, interdisciplinary education, training and outreach, entrepreneurship and economic development. CHTM will continue to invent and discover disruptive technologies that can be scaled to develop innovative advanced manufacturing initiatives to create self-sustaining wealth based economies to leave the earth a better place than we found it.

• **Spanish & Portuguese:** Three faculty members also publish creative work, primarily poetry and memoir.

• **Theatre and Dance:** Dance program, only undergraduate and graduate degree with a Flamenco Concentration in the world, noted by the Chairperson of the NEA (2016) as strong example of NEA goals of cultural preservation, transmission and rigor.

• **UNM Art Museum:** *UNM Art Museum 50th Anniversary Catalog.* Essays by Lisa Tamiris Becker and Michele Penhall. A survey of the museum’s permanent collection and history. *Stories from the Camera catalog.* Edited by Michele Penhall and features essays by former/current UNM photography faculty and staff. Melanie Yazzie: *Geographies of Memory exhibition catalog.* Essays by Lisa Tamiris Becker and Lucy Lippard. The UNAM presents exhibitions and publications produced in house or brought in from other museums. The publications highlighted above were each produced in the past two years by the museum and accompanied exhibitions. The UNAM is a teaching museum and we seek to serve the entire University community. UNAM is a public interface for the research that occurs at UNM. To date this year 2,812 people have visited the museum. I just started as director in August and am actively pursuing collaborations/engagements with departments across UNM.

Creating Connections Through Interdisciplinary Research Efforts Organized Around Problems Or Themes That Transcend Traditional Disciplinary Categories.

• **American Studies** crosses disciplinary borders by engaging with faculty in Chicano/a Studies, Latin American Studies, environmental history, and racial and ethnic Studies.

• **American Studies** faculty conducts qualitative research on national borders, human migration, labor relationships, and racial and ethnic studies. This concentration crosses several academic units, including Latin American Studies, English, and History.
• **Anthropology:** Biocultural aspects of human variation: bioarchaeology, dental anthropology; reproductive ecology, behavioral endocrinology, primate behavioral ecology; genetic and linguistic co-evolution; human population genetics; human life course and hunting/gathering societies; molecular population genetics; paleoecology of Miocene apes, humanoids; stable isotopic and dental microwear analysis; paleoanthropology.

• **Anthropology:** Linguistic anthropology; theory and history, ethnonationalism, neoliberalism, and historical consciousness; 19th century British colonialism; personhood and agency, ritual and religion, autobiographical narrative, indigenous identities; nationalist ideologies and the state; social transformations and landscapes; the licit

• **Anthropology:** Research focused upon collaborative methods, discourse and narrative grounded in attention to political economy

• **Art and Art History:** Art and Ecology is one of the newest areas of study in our department and is an interdisciplinary, research-based academic program engaging contemporary art practices. Graduate and undergraduate students develop land and cultural literacy with a conceptual foundation and a wide range of production skills, including sculpture, social practice, and digital media.

• **Art and Art History:** Decolonizing Nature: Resistance, Resilience, Revitalization is a project spear-headed by Subhankar Banerjee, Professor of Art and Ecology and Director of the Land Arts program. The gathering will bring together perspectives from the arts, humanities, religion and sciences to focus on social-environmental issues facing us in the southwest and the U.S.-Mexico borderlands.

• **Biology:** The high throughput sequencing resources in Biology and the growing interest genomics create collaborations with HSC, CARC and Engineering. A large group of faculty, including the curators of the Museum of Southwestern Biology and other Biology faculty, have established an area of excellence in Phylogeny, Systematics and Biogeography addressing a diverse group of taxonomic groups. Research in this area is also connected with the efforts in Ecology and Evolutionary Biology and the Molecular Biology Facility.

• **College of Education Multicultural Education Center:** Currently, we are working with Dr. Melanie Moses (PI, Computer Science) on the project, Computer Science for All (CSforAll) to increase the presence and learning outcomes of underrepresented student populations in the field of Computer Science. In this work, our role is to help examine the social contexts of teaching and learning in computer science to make students' experiences culturally and linguistically meaningful and rich.

• **Communication & Journalism:** In addition to working within the broad field of communication, which is an inherently "interdisciplinary discipline" we have an international and national reputation for our research and creative activity that centers on cultures and communication. We are proud of our scholarly excellence in the study of cultures as identifications, as representations, as
organizational structures, as transnational processes, as multiple, intersecting and contested, and as sites of celebration of community, heritage, and performance. We often link the study of enacted cultures with contextual contingencies such as histories, institutional policies and norms and space and place.

- **Computer Science:** Computation and Life: study of computation in nature, biologically inspired computation, and synthetic molecular computation. Computation and Life: Adaptation, self-organization, learning, and self-replication are hallmarks of life; among human artifacts, computing systems are the first to exhibit these traits. At this interface, there is potential for improving our understanding of both life and computing, and for applying that understanding to improve human health and the environment. At UNM CS, Prof. Stephanie Forrest pioneered immunocomputing. Prof. Melanie Moses studies swarm robotics inspired by social insects. Profs. Dave Ackley and Lance Williams study artificial life. Prof. Darko Stefanovic studies DNA computing with applications in biomedicine. Prof. Lydia Tapia uses robotic motion planning to understand the molecular basis of allergies.

- **Center for High Technology Materials:** Research areas of excellence include Microelectronics and Nanoscale Materials, Devices and their applications. Hospital room testbed for smart lighting, applies adaptive full color gamut lighting to health/healing in a clinical environment, involves GaN lighting sources, spectral/angular sensors, CHTM, ECE, HSC; DNA sequencing based on nanochannels with nanoporous walls. (based on nanoscale lithography, self-assembly, nanophotonic, electromagnetic resonances, of interest to Chemistry, Chemical and Biological Engineering and various departments in the HSC. Colloidal nanoparticles for biomedical applications. Of interest to Engineering, Science, and School of Medicine Departments and interdisciplinary programs: ECE, ChemBio Eng., Physics, Neurosciences, Pharmacy, Biomedical Engineering, Optical Science and Engineering.

- **CREATE (Center for Rapid Environmental Assessment and Terrain Evaluation):** CREATE conducts remote sensing and GIS based research over disciplines ranging from the Geologic and Environmental Sciences. We are heavily committed to projects on a global scale and work with scientists in China, India, across Europe as well as in South America and Australia. We also work closely with the petroleum industry.

- **Earth Data Analysis Center:** UNM collaborations: Geography, CE, CARC, Heritage, BBER, etc.; local, state, regional, tribal and national partners; supports students through employment and research opportunities.

- **English Department:** Our interdisciplinary Medieval Studies program has faculty publishing with top presses and running national organizations. By nature of our program, we interact with other units across campus.

- **Foreign Languages and Literatures:** Cultural Studies in Seven Language Areas
• **Geography & Environmental Studies:** In addition, we have a very significant area of faculty expertise in research studying Socio-Ecological Systems and Resilience at a variety of scales -- from the national and regional to the watershed and community levels. We engage with faculty in a variety of other departments to undertake large, interdisciplinary projects in this area.

• **Honors College:** Quantitative palaeoecology, led by Jason Moore who works to understand the interplay of geological, biological, and anthropogenic processes on the preservation of ecological data in the fossil record, and to use this understanding to study the drivers of change in ancient ecosystems.

• **Honors College:** Social-ecological interactions of global food systems, particularly the recent quinoa boom, studied by Marygold Walsh-Dilley, who examines the politics of resilience building in the presence of overlapping social and climate changes with a focus on indigenous communities in Andean South America.

• **Institute of Meteoritics:** Meteoritics and planetary science. This is primarily NASA funded research, highly interdisciplinary, using a wide range of analytical techniques. UNM meteorite museum is a unique source for extraterrestrial materials.

• **International Studies Institute:** Our Fall ISI Lecture series have created a veritable environment for inter-disciplinary exchanges and collaborations, as our program also includes lectures from our own faculty.

• **Linguistics:** Models of language and language change rooted in cognitive, neuropsychological and computational frameworks

• **Linguistics:** We collaborate with faculty in other disciplines to develop models of language and of language change that are rooted in cognitive, neuropsychological and computational frameworks, and that build new knowledge and understanding of language diversity and universals. Our commitment to cognitively realistic theories and data-driven methodologies has brought us international recognition. We incorporate these research findings into our instruction to empower students with empirical approaches to understanding the relationship of language, identity and power.

• **Mechanical Engineering:** Faculty and students are increasingly engaged in interdisciplinary researches in energy, micro- and nanotechnology, and bio-engineering. Areas of distinction include integrative energy systems, multiscale mechanics of materials and fluids, and dynamic systems and control, as evidenced by recent publications in top-notch journals such as Nature Communications and Scientific Reports.

• **Museum of Southwestern Biology:** As one of the most active university-based natural history museums worldwide, UNM students are afforded world-class opportunities in biodiversity informatics, comparative biology, and cutting-edge genomics.

• **Office of Contract Archeology:** Interdisciplinary research at the Water Canyon Paleoindian site in west-central NM, embracing research about past climates,
past environments and human lifeways during Late Pleistocene to early
Holocene epochs (13,000-8000 years before present); Archaeological and
interdisciplinary research about first agricultural developments and regional trade
patterns in southern NM Tularosa Basin during the El Pase Phase (ca. AD 1300-
1400); Hilltop Bison site - first evidence of bison hunting in the San Juan Basin of
NM during the Middle Archaic period (ca. 3500-4200 years before present); San
Luis de Cabezon Early Agricultural Period site - Interdisciplinary and
archaeological research about one of the earliest maize agriculture settlements in
northern NM and in the American Southwest (ca. 3200 years before present).

- **Office of Contract Archeology:** Our Archaeological research often embraces
  expertise and data from a broad range of collaborative fields, including: 1) Geology –
  (soil stratigraphy; soil micromorphology; paleohydrology; X-ray
  fluorescence [XRF] of geological raw materials, stone fracture mechanics,
  neutron activation analysis of turquoise and ceramic sherd tempers; stone raw
  material identifications); 2) Paleoenvironment / Paleoclimatology – (stable
  isotopes; studies of pollens, phytoliths & diatoms; gastropod and other faunal
  analyses; residue analyses); 3) Mapping and Cartography – (Geographic
  Information Systems (GIS) and global positional stations (GPS); total station
  surveying; site location modeling); 4) Physics – (Optically stimulated
  luminescence [OSL] dating; radiocarbon [14C] dating); 5) Digital photography
  and data collection – (using Android tablets in the field; Small Unmanned Aerial
  Vehicles [SUAV] for photogrammetry and reconnaissance surveys); 6) Human
  Subsistence – (Macrobotanical, faunal, palynological and protein residue
  analyses; analyses of starches and protein residues on artifacts)

- **Peace Studies:** Connecting cross-disciplinary research supports the further
development of integrative thought. Most recently, the program participated in
UNM’s DK2-Data to Knowledge Interdisciplinary Research Symposium it which
the program director presented on contributions to reducing risks of infectious
diseases at the animal-human-ecosystems interface. This strategic framework
addressed priority actions, specific objectives and outputs, cross-cutting and
institutional issues. Noting that violence is a public health issue the program
takes on research, policy, and practice in strategic peacebuilding education that
promotes global health and health equity.

- **Physics and Astronomy:** The Physics and Astronomy department has major
  research activities in astrophysics, optical science and photonics, quantum
  information science, and subatomic physics, with smaller efforts in biomedical
  physics. These areas take advantage of opportunities for cross-cutting,
  interdisciplinary research, with other units at UNM, with the nearby federal
  laboratories and other universities as well as in large international collaborations.

- **Political Science:** One of faculty, Professor Mala Htun, is the Deputy Director of
  Advance STEM at UNM. This project was recently awarded a $3.3 million grant
  from the National Science Foundation to promote the professional advancement
  of women and minorities in STEM fields, which includes women and minorities in
social sciences. In 2015 Dr. Htun also was also awarded an Andrew Carnegie Fellowship. She was one of 32 fellows from the social sciences and humanities named in the inaugural year of the program.

- **Psychology Department**: Evolutionary Psychology: mate choice, ovulatory cycle effects, hormonal influences, and social influences on pain. Evolutionary Psychology: Our department has an excellent program, in part due to the collaborations with other UNM departments (biology, anthropology). Our researchers study such topics as health related behavior (as informed by Evolutionary Psychology), genotype-environment interactions, prenatal development, early social development, self-regulation, evolutionary models of mental disorders, individual differences in stress responsivity, mutual mate choice, ovulatory cycle effects, and intelligence - just to name a few topics.

- **Spanish & Portuguese**: Much of the literary research is interdisciplinary, meshing literary methods with approaches from history, sociology, music, and film studies. Comparative studies figure strongly in departmental research, including work that crosses the Spanish American-Brazilian border, U.S. Latino & Latin America border, and Transatlantic exchanges.

- **Speech & Hearing Sciences**: The department’s mission includes an emphasis on creating and disseminating basic sciences, assessment, and intervention knowledge about communication sciences and disorders within our academic discipline and in collaboration with related disciplines. Our faculty routinely collaborate with faculty at other institutions -- University of Wyoming, Boys Town Research Hospital, University of South Florida, Temple University, University of Central Florida, University of Iowa -- and with units at the UNM Health Sciences Center (Brain and Behavioral Health Institute, Mind Research Network, Center for Brain Recovery and Repair) and UNM main campus departments (Linguistics, Spanish and Portuguese, Psychology, Special Education, Computer Science).

- **Theatre and Dance**: Interdisciplinary cross-cutting research: Membership in the Hemispheric Institute; Interdisciplinary courses with IFDM program: including dance, music, film faculty -

- **UNM Center for Advanced Research Computing**: UNM CARC-affiliated researchers conduct broad array of outstanding research whose common theme is being enabled by large-scale computation and computational data analysis. This research is highly interdisciplinary, encompassing a wide range of fields across the University. While the predominant work in this area is in fields such as biology, physics, medicine, computer science, and various engineering disciplines, the social sciences, including economic and anthropology are an emerging area, where high-end computation is making growing contributions which could have significant societal impact. In addition, research in this area is strongly tied to the local and regional research institutes, such as the DOE national labs and the Santa Fe Institute are also key elements of this research.
Creating connections between research and education by engaging students in research or incorporating research into the classroom and educational activities.

- **Art and Art History**: Students are involved in the Border to Baghdad an online exchange that engages students and artists through exchange of information, images and ideas and centers around the medium of the score, or set of instructions for making an artwork, that each group wrote for the other and ultimately performed and shared the results.

- **Cinematic Arts**: UNM students assisted in staging the gallery exhibit and workshop that were part of the Konefsky’s art collective Basement Films residency.

- **Linguistics**: We train students in language revitalization efforts. UNM is the only flagship university in the nation with the expertise needed to provide this type of training and support to students documenting one of the hundreds of signed languages worldwide.

- **Maxwell Museum of Anthropology**: Both the core Maxwell Museum programs and OCA heavily involve UNM students in their research activities, providing those students with opportunities not available at most institutions of higher learning.

- **Maxwell Museum of Anthropology**: The benefits to UNM students include not only academic credit but the chance to work one-to-one with established experts, in an intensive way, year after year. The vitas of those students will display experience and skills that make them more competitive than students who simply went through an academic program and got a degree.

- **Mechanical Engineering**: Students are increasingly engaged in interdisciplinary researches in energy, micro- and nanotechnology, and bio-engineering.

- **Museum of Southwestern Biology**: As one of the most active university-based natural history museums worldwide, UNM students are afforded world-class opportunities in biodiversity informatics, comparative biology, and cutting-edge genomics.

- **Political Science**: What is distinctive is that we have a group of faculty who collaborate not only with people outside our unit but also with graduate students within political science, in each of the areas identified. That is to say that no one area is 'carried' by a single faculty member. Our centers of research excellence in political science encourage collaboration and effective junior faculty mentorship.

- **Spanish & Portuguese**: Undergraduates and graduate students are engaged in research projects with faculty members, especially in the areas of corpus linguistics and producing paleographic editions of medieval and colonial texts.

- **Speech & Hearing Sciences**: The SHS faculty has focused on the involvement of undergraduate students in research. The College of Arts and Sciences' Undergraduate Research Initiative funding has provided an important mechanism for our undergraduates, especially those from underrepresented groups.

- **Theatre and Dance**: In the arts, the studio is often the equivalent of the scientific laboratory wherein creative research questions are posed and innovation solutions and practices emerge impacting the field and society. In the performing arts,
students are often directly involved with this research process. Our department offers classes exposing people to art and art making, some have never been exposed to it. Professors in our programs are on daily research process that is not evaluated in this survey. People come with different backgrounds pushing the forward, not every student will be an artist but everyone will be a member of society.

Big Questions

What research contributions are/can be made to the following:

Energy:

- **Center for Water and the Environment**: Additional research is on energy extraction process effects on water quality. We are investigating, for example, the potential for unintentional flow through the hydrofracking wellbore systems to contaminate overlying water-bearing zones. In-Situ Leach mining of Uranium not only mobilizes uranium but other constituents such as arsenic, chromium, molybdenum, selenium, and vanadium, which have the potential to contaminate aquifers. Our research focuses on the remediation of the contaminated groundwater, including removal or immobilization of the contaminants.

- **Energy EPSCoR/DataONE**: Energize New Mexico focuses on one overarching question that has great potential to transform the research enterprise in New Mexico and to promote sustainable development: How can New Mexico realize its energy development potential in a sustainable manner? This question encompasses two interrelated components: How can the efficiency of resource utilization or extractive technologies be increased? This question focuses on use-inspired fundamental research in the areas of bioalgal fuels, solar energy, and osmotic power production from oil and gas industry produced waters. Can we sustain extractive energy development with no or minimal risk to water and environmental resources? This question focuses on geothermal energy development, uranium mining and environmental remediation, and the social/science nexus that includes dynamic systems modeling and understanding factors that affect human choice and decision-making.

- **Energy Mechanical Engineering**: Faculty and students are increasingly engaged in interdisciplinary researches in energy, micro- and nanotechnology, and bio-engineering. Areas of distinction include integrative energy systems, multiscale mechanics of materials and fluids, and dynamic systems and control, as evidenced by recent publications in top-notch journals such as Nature Communications and Scientific Reports.

International Studies and Collaborations:

- **Accounting**: Joni Young, is considered a leading expert in regulation world-wide and works extensively with researchers at the London School of Economics.
• **Anthropology:** Ethnographic engagements with the histories of colonial transformation in the social systems, cultural practices, and language among indigenous peoples in North Central and South America.

• **Anthropology:** Geographical areas outside the United States in which UNM Anthropology has established excellence and distinction: Latin America (Andean zone, Mesoamerica, lowland South America); Southwestern Europe (northern Spain, southern France, Portugal); East Africa (Uganda, Ethiopia); Middle East (Israel/Palestine). Faculty also working in or collaborating with scholars in Latin America (Honduras, Mexico, Peru, Chile, Guatemala, Belize), Europe (UK, Switzerland, Spain, France, Portugal), Canada, and Morocco.

• **Art and Art History:** Biannual participation in the acclaimed Hannibal, multimillion-dollar site-specific performance in Austria; Annual participation in Asian Theatre Education Center – Only USA representative; Instructor led research into Israeli–based dance practices; Regular flamenco instructors from Spain.

• **Art and Art History:** Border to Baghdad is an online exchange created by UNM faculty and artist Szu-Han Ho and a colleague at the SADA Contemporary Art Center in Baghdad, Iraq. It aims to create an exchange between artists from the U.S.-Mexico border and Iraq. The project engages students and artists through exchange of information, images and ideas and centers around the medium of the score, or set of instructions for making an artwork, that each group wrote for the other and ultimately performed and shared the results.

• **Art and Art History:** Decolonizing Nature: Resistance, Resilience, Revitalization is a project spearheaded by Subhankar Banerjee, Professor of Art and Ecology and Director of the Land Arts program. The gathering will bring together perspectives from the arts, humanities, religion and sciences to focus on social-environmental issues facing us in the southwest and the U.S.-Mexico borderlands.

• **CETI - Center for Evolutionary and Theoretical Immunology:** CETI has been a leader in promoting research in Africa on snail-transmitted diseases like schistosomiasis that infects 250 million people, and in development of new nasal vaccines for fish diseases and in studying new models for intracellular survival of a ubiquitous human parasite Toxoplasma gondii. CETI now works closely with the Museum of Southwestern Biology on a program to explore and reveal the world’s diversity of trematode parasites.

• **Cinematic Arts:** The production of experimental films and cutting-edge curatorial practice that brings together UNM, New Mexico, and international communities. Bryan Konefsky epitomizes the community-based researcher. Last year, Konefsky’s art collective Basement Films were invited to be artists in residence at the Center for Contemporary Art in Santa Fe (UNM students assisted in staging the gallery exhibit and workshop that were part of the residency). Konefsky’s participation in the International Festival of New Latin American Cinema in
Havana has inspired a Cuban focus the 2017 iteration of his Experiments in Cinema festival.

- **Communication & Journalism:** We are also known for the multiple ways that faculty and students work in and with communities in international, national, regional and local locations and our work that attends to enhancing justice, equity and inclusion.

- **CREATE (Center for Rapid Environmental Assessment and Terrain Evaluation):** CREATE conducts remote sensing and GIS based research over disciplines ranging from the Geologic and Enviromental Sciences. We are heavily committed to projects on a global scale and work with scientists in China, India, across Europe as well as in South America and Australia. We also work closely with the petroleum industry.

- **English Department:** In American and British Literary Studies we have strength in the 19th century, on both sides of the Atlantic, in the Early Modern period (both faculty in this area are currently on grants from the prestigious Folger Library in D.C.).

- **Foreign Languages and Literatures:** A traditional way of understanding the department’s research mission involves categorization by language (Arabic, Chinese, Classics, French, German, Italian, Japanese). In fact, both periodization and areas of interest offer perhaps a more effective means of differentiating FLL’s research fields: Applied Linguistics, Classics and Classical Reception, Early Modern Literature; Comparative Literature, 20th- and 21st-Century Literature, Film Studies, Nationalism, Global Studies and Postcolonial Studies, Women, Gender and Sexuality Studies. Carmen Nocentelli’s work on Early Modern Europe, notably her 2013 book, Empires of Love, has received important recognition with top national awards and fellowship support. Professor Francis Higginson is an internationally recognized scholar of detective fiction, jazz and food in French, African and African-American culture. Professor Lorie Brau is an emerging food studies scholar with an upcoming book of Japanese popular culture (manga) and food. Professor Monica Cyrino is a leading international figure in Classical 'reception studies' -- a field that examines how contemporary culture adapts the Classical past and Classical culture. Professor Rajeshwari Vallury is nationally recognized as a scholar on post-colonial North African literature in French. Professor Lorenzo Garcia is recognized nationally as an up-and-coming Homer scholar. Professor Susanne Baackmann is internationally known for her work on German memory and trauma studies. Our two applied linguists, Tanya Ivanova and Emma Trentman, are acquiring reputations for cutting edge research on language acquisition/pedagogy and study abroad.

- **Foreign Languages and Literatures:** Literary and Film Study in Seven Language Areas

- **Honors College:** Research on the pedagogy of human rights in higher education undertaken by Sarita Cargas who has been invited to present her at international
conferences and been contracted by a major press to produce a book detailing how higher education should approach teaching human rights as a discipline.

- **International Studies Institute:** The International Studies Institute offers only an undergraduate major—one with over 220 students. Our efforts in teaching and in the lecture series is to offer opportunities for these students, as well as the greater community, to engage with international affairs, culture and scholarship. Also note that we only have one full-time faculty member who is a visiting lecturer, so expectations for research are not part of the position.

- **Latin American Programs in Education:** Research with indigenous groups in Latin America and Educational institutions in Mexico and Latin America. Several faculty in COE have been involved in this work over the years.

- **Physics and Astronomy:** The Physics and Astronomy department has major research activities in astrophysics, optical science and photonics, quantum information science, and subatomic physics, with smaller efforts in biomedical physics. These areas take advantage of opportunities for cross-cutting, interdisciplinary research, with other units at UNM, with the nearby federal laboratories and other universities as well as in large international collaborations.

- **Political Science:** Political Science excels in the area of Global Politics and Policy: Conflict, Human Rights, and Latin America.

- **Spanish & Portuguese:** Research by the literature faculty stretches from Spain to the Chicano-Latino United States, the New Mexican border region, the Caribbean, Mexico, Spanish America, Brazil, and the Philippines. Faculty members also study Colombian Spanish and Indigenous languages in contact in Peru.

- **Theatre and Dance:** International experiences and pedagogical ideas in theatre and dance.

**New Mexico / Southwest:**

- **American Studies:** Native American poverty in Albuquerque and Gallup, NM. Southwest/Hispano research, with a particular focus on New Mexico history and culture.

- **Anthropology:** Geographical areas in which UNM Anthropology has established excellence and distinction include the US Southwest (including Chaco Canyon) and the US-Mexico Borderlands

- **Art and Art History:** One of the most prominent research areas is the Land Arts of the American West program which is an ongoing experiment and interdisciplinary model for creative and critical arts pedagogy based on place. The program puts students in direct contact with place of the American Southwest, and with the hire of a new director this Fall, is expanding its scope to encompass a more international perspective.

- **Biology:** In addition to their specific research interests, the faculty in this area have collectively established a reputation in the area of Biological Responses to Climate Change with particular emphasis on the Southwestern US.
- **CASAA**: Research that addresses pressing problems in New Mexico related to alcohol and drugs, such as costs of alcohol and drug use and crime, heroin and other opiate abuse, drinking and driving, alcohol use among Native Americans, and post-traumatic stress disorder among veterans.

- **Cinematic Arts**: Investigations relating to border art and the Chicano avant-garde. A socially engaged cinematic scholarship that promotes diversity and underrepresented imagery.

- **Community and Regional Planning**: Everyday urbanisms; CRP faculty investigate the forces shaping landscapes of informal work, affordable housing, public spaces and New Mexican traditional communities. Moises Gonzales is one of the foremost scholars on New Mexican cultural landscapes, following in the tradition of Jose Rivera (now emeritus) who conducted groundbreaking work on Acequia culture.

- **English Department**: In American Literary Studies we have strength in research into the Southwest.

- **History**: The reputation of the Department in terms of its study of the American West (including a concentration in Native American history) has been well established for many decades and is widely regarded as having one of the strongest programs within universities in the Trans-Mississippi West. This fact accounts for the following recognition of the department’s excellence in this field: member of the Newberry Library Consortium in American Indian Studies (NCAIS), site of the 2013 Autry National Center of the American West Autry annual symposium for graduate student research.

- **Latin American Programs in Education**: Language revitalization in collaboration with Native American studies; Linguistics, COE. Culturally responsive education for marginalized groups in collaborations between COE and Educational Institutions in Mexico and Canada.

- **Maxwell Museum of Anthropology**: studies and presents human cultural and biological variability, with a special focus on the peoples of New Mexico and the Southwest. That research effort spans the first people to reach the Southwest, more than 10,000 years ago, to the 20th century.

- **Maxwell Museum of Anthropology**: The traditional peoples of the U.S. Southwest.

- **Office of Contract Archeology**: Interdisciplinary research at the Water Canyon Paleoindian site in west-central NM, embracing research about past climates, past environments and human lifeways during Late Pleistocene to early Holocene epochs (13,000-8000 years before present); Archaeological and interdisciplinary research about first agricultural developments and regional trade patterns in southern NM Tularosa Basin during the El Pase Phase (ca. AD 1300-1400); Hilltop Bison site - first evidence of bison hunting in the San Juan Basin of NM during the Middle Archaic period (ca. 3500-4200 years before present); San Luis de Cabezon Early Agricultural Period site - Interdisciplinary and
archaeological research about one of the earliest maize agriculture settlements in northern NM and in the American Southwest (ca. 3200 years before present).

- **Spanish & Portuguese:** The Department is especially known for its research on Southwest Spanish, with the development under the direction of Garland Bills and Neddy Vigil of the NMC OSS (New Mexico and Colorado Spanish Survey). The Southwest Studies program is known especially for its historical depth in New Mexican literature and folklore.

**Materials and Technology:**

- **Center for High Technology Materials:** Photonics; Microelectronics; Nanoscale Materials, Devices and their Applications: The mission of CHTM is to create and sustain a culture of excellence to promote research and education in photonics, microelectronics and nanoscale materials and devices and their applications, foster interaction between UNM, federal laboratories, industry and promote an entrepreneurial spirit for economic development with a regional focus but of global importance. CHTM is an international leader in the development of materials, devices, and systems for photonics, optoelectronics, microelectronics, nanoscience, nanotechnology and their application. Research areas include light matter interaction at extremely small length scales and ultrafast time intervals. Specific research topics include the epitaxial growth of compound semiconductor materials and devices, self-assembled quantum dots, quantum wells, nanowires, superlattices and lithographically-defined nanostructures, nanophotonics, doped and poled optical fibers, microring resonators and ultrafast optics, 2D materials and their structural, mechanical and electronic properties, application of 2D materials to flexible electronics, optoelectronics and photonics, rolled-up nanotech, bio-devices integration, materials for THz radiation, nano-scale magnetometry and MRI with nitrogen-vacancy centers in diamond, and nanoscale thermal energy conversion. Device studies include near infrared, detectors and sources for datacomm and telecomm, avalanche photodiodes, semiconductor lasers, longer wavelength infrared sources and detectors, photovoltaics, nanofluidsics, GaN-based visible and UV sources, solid-state lighting and high-efficiency LEDs, visible edge-emitting and vertical-cavity surface-emitting lasers, applications of group III-nitrides to energy efficiency and renewable energy, and novel readout-circuit concepts for smart-pixel imagers. Systems related research includes advanced optical lithography, interferometric lithography, spectral sensing and imaging, molecular imaging with optically-pumped fluorophores, vibrometry using synthetic-aperture radar, ultrafast optical receivers, and microscopy. Emerging areas of research include, Anderson localization and wave propagation in random media, plasmonics, metamaterials and metasystems in the broader context of classical, quantum and computational imaging.

- **Center for High Technology Materials:** is committed to training the next generation of scientists, engineers, discoverers and entrepreneurs who can
combine their technical training and critical thinking with excellent interpersonal and communication skills to become leaders of the 21st century. Our core strengths are: Research, creativity and innovation, interdisciplinary education, training and outreach, entrepreneurship and economic development. CHTM will continue to invent and discover disruptive technologies that can be scaled to develop innovative advanced manufacturing initiatives to create self-sustaining wealth based economies to leave the earth a better place than we found it.

- **Institute of Meteoritics**: High pressure mineral physics. We have cutting edge laboratories featuring diamond anvil cell (DAC) and multi-anvil devices for simulate conditions in the Earth’s interior. We also are the home institution for COMPRES.

- **Center for Quantum Information and Control (CQuIC)**: Full quantum control of the states and dynamics of the ground manifold of atomic cesium, for the purpose of quantum information processing. Fundamental theoretical analyses of the quantum limitations of the sensitivity of high-precision measurements. Seminal investigations of ground-state entanglement in many-body systems as a resource for quantum computation. Experimental investigations of techniques for robust discrimination of quantum states, for the purposes of reliable and efficient communication.

- **Center for High Technology Materials**: CHTM is an international leader in the development of materials, devices, and systems for photonics, optoelectronics, microelectronics, nanoscience, nanotechnology and their application. Research areas include light matter interaction at extremely small length scales and ultrafast time intervals.

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telecomm, avalanche photodiodes, semiconductor lasers, longer wavelength infrared sources and detectors, photovoltaics, nanofluidics, GaN-based visible and UV sources, solid-state lighting and high-efficiency LEDs, visible edge-emitting and vertical-cavity surface-emitting lasers, applications of group III-nitrides to energy efficiency and renewable energy, and novel readout-circuit concepts for smart-pixel imagers. Systems related research includes advanced optical lithography, interferometric lithography, spectral sensing and imaging, molecular imaging with optically-pumped fluorophores, vibrometry using synthetic-aperture radar, ultrafast optical receivers, and microscopy. Emerging areas of research include, Anderson localization and wave propagation in random media, plasmonics, metamaterials and metasystems in the broader context of classical, quantum and computational imaging.

- **Center for Micro-Engineered Materials**: UNM Center for Micro-Engineered Materials is a materials research institute that specializes nano-materials research based on chemistry and chemical engineering synthetic approaches. Area of currently funded research endeavors are as follows (only areas totaling of $1M/year expenditures or higher are listed): 1. Novel Materials For Energy Conversion & Storage: nano-structured non-PGM catalysts for HOR/HER and ORR/ORR as well as non-carbon fuel synthesis and utilization (ammonia, hydrazine), self-regenerating PGM catalysts for low temperature oxidation and hydrogen generation. 2. Materials and catalysts for bio-driven feed-stock conversion, utilization and valuation. 3. Bio-electrochemical Systems and Bio-inspired Catalysts: microbial fuel cells, electrolysers and water purification systems and adaptive catalysts cascades for deep oxidation of complex fuels. 4. Proto-cells: Mesoporous Materials for Drug Delivery and Therapeutics Advanced Additive Manufacturing: technology platform based on 3D printing of functional nano-materials with feature controls at meso-scale and scale-up to macro-scale films and devices.

- **COSMIAC**: Additive Manufacturing (AM) and Micro Dispensing (MD) - Working with NASA, UTEP and AFRL on 3D printing for space and high power RF applications

- **Mechanical Engineering**: Faculty and students are increasingly engaged in interdisciplinary researches in energy, micro- and nanotechnology, and bio-engineering. Areas of distinction include integrative energy systems, multiscale mechanics of materials and fluids, and dynamic systems and control, as evidenced by recent publications in top-notch journals such as Nature Communications and Scientific Reports.

**Water & Arid Environments**:

- **Community and Regional Planning**: Food and water systems planning: CRP faculty blend the boundaries of basic and applied research and engaged scholarship in numerous projects that investigate the potential for systemic transformation in water use and reuse and local food systems
• **Community and Regional Planning:** Moises Gonzales is one of the foremost scholars on New Mexican cultural landscapes, following in the tradition of Jose Rivera (now emeritus) who conducted groundbreaking work on Acequia culture. The Utton Center is the only center in the State focused on water law. We have developed distinctive expertise in environmental, agricultural and Native American water rights.

• **Center for Water and the Environment:** Water resources and watersheds, water quality and treatment; water and energy; water policy and society; Water utilities management, finance, and technologies?

• **Geography & Environmental Studies:** In addition, we have a very significant area of faculty expertise in research studying Socio-Ecological Systems and Resilience at a variety of scales -- from the national and regional to the watershed and community levels. We engage with faculty in a variety of other departments to undertake large, interdisciplinary projects in this area.

• **Museum of Southwestern Biology:** Comparative genomics of non-model organisms to include understanding the genomics of adaptation (to altitude, aridity, etc), genomic signatures of coevolution (e.g., host-parasite), and genomics of speciation, diversification and hybridization.
Appendix A3: Evaluation of Research Criteria by Chairs and Directors

Criteria Rating For Research Excellence
Mean rating by all survey respondents (on a scale of 1: not important to 5: very important) of different criteria for research excellence.

<table>
<thead>
<tr>
<th>Research Products</th>
<th>Mean Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prestige</td>
<td>3.24</td>
</tr>
<tr>
<td>Funding $</td>
<td>3.35</td>
</tr>
<tr>
<td>Publication Numbers</td>
<td>3.72</td>
</tr>
<tr>
<td>Publication Quality</td>
<td>3.89</td>
</tr>
<tr>
<td>Number Of Exhibitions</td>
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</tr>
<tr>
<td>Quality Of Exhibitions</td>
<td>2.28</td>
</tr>
<tr>
<td>Number Of Patents</td>
<td>1.65</td>
</tr>
<tr>
<td>New Initiatives</td>
<td>3.28</td>
</tr>
<tr>
<td>Novelty &amp; Creativity</td>
<td></td>
</tr>
<tr>
<td>Distinctiveness/Innovation</td>
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</tr>
<tr>
<td>Generates New Approaches</td>
<td>3.91</td>
</tr>
<tr>
<td>Demonstrable Research Impact</td>
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</tr>
<tr>
<td>Recognition</td>
<td></td>
</tr>
<tr>
<td>Invited Keynotes</td>
<td>3.73</td>
</tr>
<tr>
<td>Academic Awards</td>
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</tr>
<tr>
<td>Memberships</td>
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<tr>
<td>Performance In Competitions</td>
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</tr>
<tr>
<td>Student Involvement In Research</td>
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</tr>
<tr>
<td>Number Of Students</td>
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</tr>
<tr>
<td>Placement/Recognition Of Students</td>
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<tr>
<td>New Courses</td>
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<tr>
<td>Research Visibility</td>
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<tr>
<td>Media</td>
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<tr>
<td>High Visibility Collaborations</td>
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</tr>
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</table>
### Impact On Public Policy

<table>
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<th>Category</th>
<th>Score</th>
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<tbody>
<tr>
<td>Community Engagement</td>
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<td>Comm. Partners</td>
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<tr>
<td>Service Learning</td>
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<td>Outreach</td>
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<tr>
<td>Diversity</td>
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<tr>
<td># Of Underrepresented Students/Faculty</td>
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<tr>
<td># And Diversity Of Undergrad Research</td>
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<tr>
<td>Research On Underrepresented Topics</td>
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<tr>
<td>Interdisciplinary</td>
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<tr>
<td># Publications In Other Disciplines</td>
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<tr>
<td>Appointments In Multiple Depts.</td>
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</tr>
<tr>
<td>Collaborations Across Disciplines</td>
<td>3.32</td>
</tr>
</tbody>
</table>

Additional Research Criteria Listed by Department Chairs and Directors.

- **Anthropology:** International collaborations that lead to new scientific questions; innovative new methodologies and theories that address those questions.
- **Anthropology:** Public outreach and public demonstrations, community development initiatives, consultation and collaboration with regional and international descendant and local communities or federal programs that include a focus on heritage research and public education.
- **Anthropology:** Research that illuminates the historically constructed character of social science categories and typologies, and critical inquiry into those constructions.
- **Art & Art History:** In the arts studio practice is the equivalent to scientific laboratory experiments and is the method through which many faculty produce their creative research. Others in our department are more traditional in academic humanities scholarship of archival research and publications. We work closely with our students and collaboration with them is an essential part of many artists' research programs.
- **Biology:** Quality of research as evaluated by the selectivity of the peer-reviewed journals where it is published.
- **Biology:** Research excellence in Biology can be found in groups of faculty with closely aligned interests and collaborations, and in the broad coverage of a field such as Biology through the leadership of highly motivated scholars. The pursuit of research excellence sometimes favors the former over the latter at the risk of concentrating resources to the exclusion of individual faculty labs that don't fit the model.
• **Center for Micro-Engineered Materials**: H-factor of the researcher; Citations (less self-citations); Impact factor of the journals where the work is being published

• **Center for Micro-Engineered Materials**: Number PhD graduated from the program; their professional placement and success

• **Center for Micro-Engineered Materials**: Visibility - natural and International is a must. There is only one criterion for science: 'the world criteria', true science cannot be local, regional or even national.

• **CETI - Center for Evolutionary and Theoretical Immunology**: an ability, with the help of appropriate mentoring, for CETI investigators to submit competitive research proposals that are well-received in the most competitive of funding agencies

• **CETI - Center for Evolutionary and Theoretical Immunology**: an ability to organize and develop a research program able to generate quality data resulting in publications in peer-reviewed journals of the highest quality

• **CETI - Center for Evolutionary and Theoretical Immunology**: Research receives remarkably little attention at UNM. Much, much more needs to be done to support the activities of PIs that work so hard to generate the proposals that support the entire enterprise. They are the real heroes at UNM because they are often the superb teachers as well. UNM has a long way to go to make their community of researchers feel better in their interactions with the administration. Imposition of inviolable deadlines regarding submission (often well before agency deadlines), abrupt treatments and decisions from administrators perceived to have little knowledge of and talent for research really rankle. Researchers are the ones with the exceptional talents that UNM must figure out how to absolutely cherish, and preemptively support including with salary increases, or we will lose them to more research-friendly environments.

• **CETI - Center for Evolutionary and Theoretical Immunology**: to engage in effective training of both graduate and undergraduate students and postdocs and to contribute to and be supportive of a vibrant research environment at UNM

• **Cinematic Arts**: Quality of publication NOT measured by impact factors, citation indices etc i.e. Is the work well-written, compelling, readable?

• **Communication and Journalism**: Co-authoring publications with doctoral students. Mentoring and involving graduate students and undergraduate students in research projects.

• **Community and Regional Planning**: Research project process or findings benefits community partners directly; Research project process or findings benefits community partners through building capacity for further organization growth or community change; Demonstrable impact that community partners made on research questions, findings or methods; The responses were not tied to the specific research areas but to the intersection between research and engaged scholarship.

• **COSMIAC**: How the research thrust fits within the climate of what is going on more broadly in the State of New Mexico
- **COSMIAC**: Reputation of the research in the eyes of peers at top institutions internationally
- **COSMIAC**: Total funding compared to other units in the School and University
- **CREATE (Center for Rapid Environmental Assessment and Terrain Evaluation)**: Novelty of work; Public good, Global scale
- **Earth Data Analysis Center**: Continue to bring in enough research dollars to remain self-sustaining.
- **Earth Data Analysis Center**: Continue to build a positive reputation as effective collaborators within our constituents.
- **Earth Data Analysis Center**: Continue to support our mission and that of the University, while providing unique research opportunities for our staff and students
- **Earth Data Analysis Center**: EDAC’s most recent strategic planning efforts include expanded our research into engineering and use and operation of unmanned aerial vehicles, as a natural progression of a number of our current applied research initiatives.
- **Economics**: Quality of journal publications and citation impacts; impact on public policy; interdisciplinary collaborations; Research excellence is dependent upon enhancing and maintaining critical mass of faculty in centers of gravity or core strengths, such as environmental, resource and ecological economics. Research excellence is dependent upon keeping continuity and adequate staffing (with market pay rates) for research support at the department level. There are limits to the service center model when it comes to maintaining research strength in a unit.
- **EPSCoR/DataONE**: Research excellence at UNM seems to be recognized when it is good research focused on a narrow, disciplinary topic. I do not believe that large, transdisciplinary and interdisciplinary research projects are valued to the same extent that they are are at most major top-flight research universities.
- **EPSCoR/DataONE**: Sustainable energy development: promoting research collaborations in six areas--bioalgal, osmotic power, geothermal, Uranium, solar, and the nexus of social and natural sciences (i.e. modeling)
- **Center for Micro-Engineered Materials**: Number of type of companies started, supported and licensed technology to; licensing income
- **Museum of Southwestern Biology**: Long-term impact--at the end of one's career, what infrastructure have you developed that will endure and stimulate future research and teaching opportunities at UNM
- **Foreign Languages and Literatures**: Quality of research as measured by peer readers and evaluators
- **History**: Quality of University Press/Journal; Book Reviews
- **History**: The program’s reputation rests on its ability to consistently win nationally competitive grants from Fulbright, Fulbright-Hayes, the Andrew Mellon Foundation, and the National Endowment for the Humanities for its doctoral students and faculty

I am uneasy about the continued efforts to measure research productivity as the metrics often seem to be one-sidedly favoring stem disciplines. In our department,
we also do research has may not have a new and unique quality but provides a public service in editing texts, translation, book reviewing for academic journals, writing encyclopedia entries, etc. All of these activities contribute to our discipline and its success, including the students', but do not get measured by strict book or scholarly article metrics and thus fail to capture adequately what we do. Therefore, instead of trying to force every discipline on campus into the same rubrics, compare apples to apples and not apples to oranges.

- **Language Literature and Sociocultural Studies**: Recognition/requests by communities and or community organizations for research assistance. Initiatives/programs that are a result of Community Engaged research. Include under Diversity in Research, research in international settings.

- **Linguistics**: Proportion of department's doctoral students working on a research topic; Quantity & Quality of research products produced for community needs; Co-authorship of presentations and publications with students

- **Manufacturing Engineering**: If the overarching purpose of a university is to create and transmit materials as parcels of education, then the definition of research should include the creation and transmission of materials that enhance a workforce pipeline that extends beyond a university.

- **Marketing, Information Systems, & Decision Sciences**: Recognized level of high quality publications based upon international journal lists as well as lists published by top universities in the discipline; National Science Foundation Grants

- **Maxwell Museum of Anthropology** is a non-academic unit; to the extent that staff teach or serve on committees, they do so through overlapping or adjunct appointments in academic departments. That causes us to have a low profile internally, since so much of UNM's introspection starts with the assumption that there are academic units and there are 'support' units. But we do original research! And we do involved students in that research!

- **Museum of Southwestern Biology**: Interdisciplinary catalyst

- **Museum of Southwestern Biology**: Success of under-represented students trained (not just how many)

- **Peace Studies**: Fantastic opportunities for locating funding sources for new and existing initiatives, as well as working with international technical agencies, collaborations.

- **Psychology Department**: Specialized lower impact journals are oftentimes viewed as acceptable in certain research areas.

- **Theatre and Dance**: Professorial and curricular practices reflecting NEA criteria for excellence; Cultural preservation and transmission at the highest level of professional involvement and artistic rigor.
Appendix A4: Research Active Units And Their Chairs And Directors

Departments and Centers that responded to the survey with narrative data

- Accounting
- American Studies
- Anthropology
- Art and Art History
- Biology
- Center on Alcoholism, Substance Abuse and Addictions (CASAA)
- Center for High Technology Materials (CHTM)
- Center for Micro-Engineered Materials (CMEM)
- Center for Quantum Information and Control (CQuIC)
- Center for Water and the Environment
- CETI - Center for Evolutionary and Theoretical Immunology
- Cinematic Arts
- College of Education Multicultural Education Center
- Communication & Journalism
- Community and Regional Planning
- Computer Science
- COSMIAC
- CREATE (Center for Rapid Environmental Assessment and Terrain Evaluation)
- Earth Data Analysis Center
- Economics
- English
- EPSCoR/DataONE
- Foreign Languages and Literatures
- Geography & Environmental Studies
- History
- Honors College
- Institute of Meteoritics
- International Studies Institute
- Landscape Architecture
- Language Literacy and Sociocultural Studies
- Latin American Programs in Education
- Linguistics
- Manufacturing Engineering Program
- Marketing, Information Systems, & Decision Sciences
- Maxwell Museum of Anthropology
- Mechanical Engineering
- Museum of Southwestern Biology
- Music
- Office of Contract Archeology
- Peace Studies
- Physics and Astronomy
- Political Science
- Psychology Department
- Spanish & Portuguese
- Speech & Hearing Sciences
- Theatre and Dance
- UNM Art Museum
- UNM Center for Advanced Research Computing
- Utton Center
### List of Chairs and Center Directors invited to respond to the Survey

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<th>College/School</th>
<th>Department</th>
<th>Name</th>
<th>E-mail</th>
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<tr>
<td>Arts &amp; Sciences (A&amp;S)</td>
<td>American Studies</td>
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<td>Anthropology</td>
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<td>Communication and Journalism</td>
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<td>Senior Associate Dean</td>
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| School of Architecture & Planning                   |                     |                     |

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<td>Plamen Atanassov</td>
<td><a href="mailto:plamen@unm.edu">plamen@unm.edu</a></td>
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Appendix B: Summary Of Interviews

The summary below encapsulates interview responses in the larger framework of research excellence. Recommendations for strategic support and development are aggregated and included in the final section.

- Breaking Barriers to new knowledge and understanding
  - Institute for Meteoritics is a national resource, with an impressive collection of meteorites and the Meteorite Museum. Researchers have instruments on the Mars rover.
  - Materials Science: There are many decades of expertise even before CHTM including facilities and high profile individual research programs. UNM was ranked as having top Materials Science research even though there is no official materials science program. Our connection to the labs for this work is important.
  - Housing: there is a long history of engagement in planning and design.
  - Accreditation team for Planning said they are the strongest community-based planning dept. in nation.
  - Landscape - one of the strongest landscape design programs.
  - Arid lands - organizationally not fully developed, but several individual faculty have expertise. Topics such as acequias, water systems, design of cisterns and landscaping.
  - Electromagnetics is excellent and has unique and impressive infrastructure. High powered microwaves to make plasmas.
  - Business Ethics: Anderson seen as a leader in corporate social responsibility; put on the map by Jeanne Logsdon. Three Anderson faculty have served as division chair for Social Issues in Management Division of the Academy of Management (primary professional association).
  - Information Assurance: one of the Centers of Academic Excellence in Information Assurance designated by the NSA and Homeland Security.
  - The Mind Research Network is highly regarded nationally and internationally in brain imaging, neuroinformatics, and advanced analytics.
  - Management of Technology: two distinguished professors work in this area. Related to national labs, helping startups (business plan competition).
  - UNM has a tremendous sense of place that unifies much of the research efforts in Arts and Sciences (A&S).
    - For example, the long ties to Physics and the National Labs have formed a basis for research in particle physics, optics, and quantum information.
    - The rich cultural heritage of New Mexico has shaped much of the research in Archeology, Cultural Anthropology, and Social...
Research in the College, and led to some of the best interdisciplinary work and centers (LAII comes to mind).

- Through the Latin American and Iberian Institute (LAII), UNM has maintained a strong commitment to studying Latin American populations including the people of Mexico, Spanish and Creole-speaking parts of the Caribbean, Central and South America and Hispanic communities in the US. LAII has identified 99 faculty members who are actively engaged in Latin America or Iberia-focused research. These colleagues hold appointments in 9 different colleges. In the past 5 years collectively they have published 410 articles and book chapters and 41 scholarly books.

- Ecological research in arid land systems is a major focus, as is the geological history of the region including the greater Southwestern US and Central America.

- Research in COE relates to a number of broad areas linked to NM environment and communities such as STEM, Dual language education, bilingual education, Health, and other areas that reflect issues in diverse communities.

- Health Education field is an example of cross-cutting research especially with increasing emphasis on the impact of the environment on health; research that is being done in areas of genomics and brain research are examples.

  - Research in CASAA is excellent fundamental research and somewhat problem driven;
  - CHTM/CMEM energy and materials and photonic materials, with a heavy-duty application bent.
  - Fundamental research in biology (CETI). Many units and people involved in cross-cutting research, and application-based research.

- Breaking Barriers between communities and the academy in community-engaged research

  - Community-engaged research at UNM is distinctive by the nature of our community. We are a metropolitan area in a rural, high-poverty state.
  - Fine Arts, Architecture and Planning and Education colleges have well-defined community-engaged research missions that they encourage and evaluate systematically.
  - Digital fabrication and visualization. There is a fabrication lab (service center) with equipment that no one else in state has. It is strong for education purposes, community-engaged work like building playhouses, little free libraries, and museum displays.
  - Institute for Medieval Studies (Tim Graham) holds symposia and lectures that are packed with community attendance
Critical Accounting: strong group that publishes in Accounting, Organizations and Society, including the editor of the journal. This area meshes with social responsibility.

Participatory approach is being used in research related to preparation of teachers such as the COE Transformative Action Groups; this COE project is a cross disciplinary initiative to transform teacher preparation involving faculty across different departments within COE; project has a thorough evaluation framework built into this Kellogg funded research project.

COE Re-imagining TAG group is one example because it includes an evaluation framework for assessing the impact of the project on teacher preparation as well as the schools and communities where the project is situated. It also includes a component of self-reflection for faculty participating in this project.

The Latin American and Iberian Institute (LAII) is currently focusing research on criminal and police violence in Latin America in the areas of Sociology, Political Science, Anthropology, History, Community and Regional Planning and Art and Art History.

Breaking Barriers to underrepresented populations and topics to promote diversity in academic research

- Community-engaged research is more prevalent in NM than many other places.
- We have many first-generation higher-education students.
- Many students arrive at UNM with prior service-learning experiences.
- The University has a large and diverse student population, appropriate for a Carnegie-designated “High Hispanic-serving” institution and a Research Level-One Institution. This student population acts as a catalyst for faculty to undertake distinctive research.
- We provide a flagship education to a non-traditional undergraduate population, and we have excellent research in areas of interest to the communities we serve: Hispano / Latino (in NM), Latin America, Native-American and by extension, indigenous communities in other parts of the world.
- We study diverse communities and under-represented groups
  - race / ethnicity as a component of other things, e.g. criminology
  - The Chaco Canyon research including the Hibben collection & National Park Service archives
  - Land Arts of the American West (supported by the Lannan and Mellon Foundations) enters into meaningful collaborations with communities within New Mexico and across the Southwest.
  - The Latin American and Iberian Institute (LAII) sponsors conferences across a range of themes including workshops on asylum for migrants fleeing violence, authority and identity in Colonial Ibero-America,
Africans and their descendants in Early Modern Latin America and a symposium on mutual influences of US and Latin American filmmakers.

- Breaking Barriers in expression by fostering creativity, performance and novelty
  - The College of Fine Arts (CFA) has fostered creativity in the visual and performing arts through a nationally and internationally recognized faculty across the fields of Music, Art and Art History, Cinematic Arts and Theater and Dance. The Tamarind Institute is recognized as the premier printmaking institution in the world. CFA’s Arts Learning Laboratory is dedicated to innovative arts education practices evidenced through Land Arts of the American West, Arts-in-Medicine and Dancing Legacy Partnership with Brown University. The Interdisciplinary Film and Digital Media program in Cinematic Arts serves as a center for ground-breaking collaborations and training for UNM students. The Creative Leadership Initiative, newly redesigned through a McCune Foundation grant prepares future artists and arts administrators to become active participants in their larger communities.
  - Highlight our museums (Meteorite, Hibben Collection, SW biology)
  - Extensive creative interdisciplinary work is already ongoing (e.g. work on mars program, work at the various centers (MRN, CASAA, CHTM, etc) and should be expanded.

- Creating Connections through interdisciplinary research efforts organized around problems or themes that transcend traditional disciplinary categories
  - In the College of Education (COE) a cross-disciplinary project entitled Transformative Action Groups works to transform teacher preparation involving faculty across different departments within COE.
  - The Social Determinants of Health Collaborative with the Health Sciences Center focuses on the impacts of health issues.
  - The NEA research program director added the importance of working in an interdisciplinary way to advance knowledge in both fields, highlighting the value and impact the arts have on ideas and communities as well as the impact that other domains have on the arts. His/her example was recent NEA-funded project at UNM, a collaboration between CFA Music and North Campus that resulted in the article: “Musical Creativity Revealed in Brain Structure: Interplay between Motor, Default Mode and Limbic Networks”, Nature-Scientific Reports 6 (2016)
  - Collaborations with the Health Sciences Center, particularly Cancer Research Center and other basic cancer research "Indigenous design" – one of the first such programs in the world.
No other university has connections with the national labs... Sandia (largest number of phd's from UNM), same for Los Alamos (#2 is Univ of Illinois)... grown some areas in cyber... AFRL, Sandia, Los Alamos (research & high energy density physics)... not for large companies, but Fed Gov is spending 5-10 billion, most in new mexico....

Center for Stable Isotopes created 3 years ago by bringing together EPS and Biology faculty who needed same tools for similar work.

We can take simple steps that encourage understanding between units: example a PIVOT training that helps faculty in one unit understand how the rest of the university will view you: update profile.

Get faculty out of the department/college to communicate with faculty in other departments/colleges. What can we be doing to get more engaged across campus.

Creating a more effective infrastructure for shared resources. Also an opportunity to create research collaborations.

Big vision... should be focusing on problems vs solutions (technologies)... poverty, energy, healthcare, environment (green energy/smart grid), can attack one big problem from multiple areas.... (e.g. water, have river w/ state/international issues.... weather problems.... technologies... center for water/energy/policy... alpha centura beaming...

There should be more seed funding that encourages main campus and north campus to collaborate.

Get companies to buy in to join consortium... not a lot of companies.... maybe do something IP free... we do very well in terms of research funding/faculty (about 1000 faculty, about 250 funded at very high rate... )... about $100,000 each... or almost $400K across the 250.... higher 10 people (1-2 will be getting numbers of the others)...

Team up... boeing, raytheon, going for $250 million proposals.... how to team up with these large proposals... craig kief teamed up with wiley (gets $1M/year for just hiring 4 people and give them appointments... ).... hispanic opportunities... vehicle for large contracts....

External centers (like The Mind Research Network) are great resources for collaborative work.

Areas of Excellent Cross cutting research: Energy, Water, Information, Global systems, Biodiversity, Latin American Studies, Race and Ethnicity, History and Culture, Human-Biological-Geological Coupled systems with special emphasis on arid lands.

D2K symposium that focused on linking research strengths through big data analysis and synthesis. http://news.unm.edu/news/researchers-discuss-opportunities-and-collaborations-at-data-to-knowledge-symposium
The Women, Work, Water initiative was funded by the National Science Foundation (NSF) and explored the role of the humanities in scientific research, introducing narrative and visual arts to the sciences while introducing data concepts to humanities faculty and students.

- Creating Connections between research and education by engaging students in research or incorporating research into the classroom and educational activities.
  - The College of Fine Arts’ Arts Learning Laboratory has promoted a ground-breaking pedagogy for the arts and creative leadership for nearly a decade.
  - The STEM collaborative program has created pipelines for students to enter into STEM study at UNM
  - Biggest problem is education system (K-12) is not preparing people for university

Big Questions:
- Energy
  - CHTM/CMEM centers do research in energy and materials and photonic materials with potentially important applications.
  - Los Alamos (research & high energy density physics)
  - Link work between climate and ecological research to clean energy
  - CHTM/CMEM centers do research in energy and materials and photonic materials

- Water/Environment
  - UNM research in areas that intersect ecology, climatology and high-performance computing. UNM can help the national labs improve climate models through use of novel devices and energy studies.
  - Link research in water problems and remediation to ecosystems research
  - Sustainability Studies, including cross-disciplinary food inquiry
  - Many Art and Ecology programs including Land Arts of the American West
  - Institute for Meteoritics is a national resource, with an impressive collection of meteorites and the Meteorite Museum. Researchers have instruments on the Mars rover (lots of implications, e.g. policies, longevity, prosthetics, music, etc)
  - AFRL on weather, space sciences (specific to engineering)...future of humanity
  - Green energy/smart grid
  - The Latin American and Iberian Institute (LAII) has emerging areas of research related to food production and trade in Latin America combining international markets, cultural meanings of foods and how these are effected by international forces. The LAII is also focusing research on the
stresses produced by climate change in Latin American Societies related to water supply, flooding and reduced or altered agricultural productivity.

- Social and cultural issues (Health and Addiction)
  - Research in CASAA on substance use/addiction.
  - The Arts-in-Medicine program is a model for palliative care, veteran care, and AIDS, drug and chronic illness arts intervention and has been for more than a decade. Program reach is across New Mexico and internationally in Africa.
  - Collaborations with the Health Sciences Center, particularly Cancer Research Center and other basic cancer research "Indigenous design" – one of the first such programs in the world.
  - The Mind Research Network does extensive brain imaging and genetics work across a wide variety of areas (mental illness, substance use, ADHD, normative development, brain injury, cognitive impairment, etc.)
  - Business Ethics: Anderson seen as a leader in corporate social responsibility; put on the map by Jeanne Logsdon. Three Anderson faculty have served as division chair for Social Issues in Management Division of the Academy of Management (primary professional association).
  - The Social Determinants of Health Collaborative with the Health Sciences Center focuses on the impacts of health issues.

- Place-based research in NM
  - College of Education is undertaking research in a number of broad areas linked to the NM environment, including bilingual education, health and others that reflect issues in indigenous and other NM communities.
  - Areas of local research include: southwestern archeology, the New Mexico Historical Review, UNM Press volumes on the Southwest, Hispanic Historical Review, Journal of Anthropological Research and the Historic Preservation and Regionalism Program in the School of Architecture, as well as Land Arts of the American West, Indigenous and Latin American Arts, Flamenco Studies, etc.
  - Landscape - one of strongest landscape design programs
  - Economic development
    - UNM Small Business Institute has received press for its impact on the economy
Appendix C: Analysis of Quantitative Data for Research Excellence Working Group

We obtained quantitative data of various kinds to provide objective information about the strength of the research enterprise in different schools and colleges. While size alone does not speak to the quality of the research in different units, programs and departments with thriving research are likely to attract graduate students, who will themselves produce more research. The correlation between research funding and activity varies across domains, with STEM fields likely to obtain larger amounts of external funding than are programs in arts, humanities, and education. Despite these caveats, numerical data can provide some insight as to which areas of activity are more active at UNM.

I. Numbers Of Faculty In Departments
Data on the numbers of main campus faculty as of September 27, 2016, were provided by Faculty Contracts. The first issue in using these data is defining “research-active” faculty.

For purposes of this analysis, all tenured and tenure-track faculty were included (Asst. Prof., Assoc. Prof., Prof., Distinguished Prof.). All faculty holding a title that included the word “Research” were included, including those identified as “Research Lecturer” or “Research Scholar”. All other titles including the word “Lecturer” were excluded. Professors of Practice were excluded.

Besides the Colleges and Schools that might be the most obvious affiliations, faculty are also affiliated with the University Libraries (27, plus 7 in the OILS program), and with the OVPR and four research centers that report to the OVPR. These all have relatively small numbers of faculty assigned to them (the largest is CHTM at 7 faculty).
Table C.1: Number of tenured, tenure-track, and research faculty in the 20 main campus departments with the most faculty

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<th>Research Faculty</th>
<th>Tenured &amp; Tenure-Track</th>
<th>Name Of Department</th>
<th>Name Of College/School</th>
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Ten of the 20 largest departments by faculty count are in the College of Arts & Sciences.
Following is a listing of all units that are the primary affiliation for one or more faculty.
Table C 2: Number of tenured, tenure-track, and research faculty as of September 2016.

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<td></td>
</tr>
<tr>
<td>Landscape Architecture Program</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
### Numbers of graduate students in programs

Data: The Graduate School provided the numbers of graduate students in the various graduate programs for the fall semester 2014, fall 2015 and fall 2016. These were averaged to create the data set used for the analyses reported here. Programs based in Health Sciences were excluded from these analyses.

<table>
<thead>
<tr>
<th>University Libraries</th>
<th>Organization Info Learning Science</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Libraries</td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Vice President For Research</td>
<td>Ctr For Education Policy Research</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Ctr For High Tech Materials</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Ctr For Micro Engineering Materials</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Inst For Policy, Eval &amp; Applied Res</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Vp Resrch &amp; Econ Devlpmnt</td>
<td>4</td>
</tr>
<tr>
<td>College</td>
<td>Department Or Program</td>
<td>Avg. Number Grad Students</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>School Of Public Administration</td>
<td>School Of Public Administration</td>
<td>154</td>
</tr>
<tr>
<td>College Of Fine Arts</td>
<td>Art Art History</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>Music</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Theatre And Dance</td>
<td>14</td>
</tr>
<tr>
<td>College Of Arts &amp; Sciences</td>
<td>American Studies</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Anthropology</td>
<td>114</td>
</tr>
<tr>
<td></td>
<td>Biology</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Latin American Studies</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Communication Journalism</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Earth And Planetary Sciences</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Economics</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Foreign Languages Literatures</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Geography</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>History</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Linguistics</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Mathematics Statistics</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>Philosophy</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Physics Astronomy</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Political Science</td>
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</tr>
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<td></td>
<td>Psychology</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>Sociology</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>Spanish Portuguese</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Speech And Hearing Sciences</td>
<td>57</td>
</tr>
<tr>
<td>College Of Education</td>
<td>Teacher Ed, Ed Lead &amp; Policy</td>
<td>285</td>
</tr>
<tr>
<td></td>
<td>Educational Specialties Ed Spec</td>
<td>148</td>
</tr>
<tr>
<td></td>
<td>Health Exercise &amp; Sports Science</td>
<td>154</td>
</tr>
<tr>
<td>College Of Education</td>
<td>Individual Family Comm Educ</td>
<td>172</td>
</tr>
</tbody>
</table>
### Table C 3: Average (fall semesters 2014-2016) count of graduate students in graduate programs, 15 largest.

<table>
<thead>
<tr>
<th>College</th>
<th>Department</th>
<th>Avg. Number Grad Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>College Of Education COE</td>
<td>Dept Teacher Ed, Ed Lead &amp; Policy</td>
<td>285</td>
</tr>
<tr>
<td>School Of Engineering</td>
<td>Electrical Computer Engineering</td>
<td>232</td>
</tr>
<tr>
<td>College Of Education COE</td>
<td>Language Literacy Sociocultural Li</td>
<td>207</td>
</tr>
<tr>
<td>School Of Engineering</td>
<td>Computer Science</td>
<td>181</td>
</tr>
<tr>
<td>College Of Education COE</td>
<td>Individual Family Comm Educ IFCE</td>
<td>172</td>
</tr>
<tr>
<td>School Of Public Administration</td>
<td>School Of Public Administration</td>
<td>154</td>
</tr>
<tr>
<td>College Of Education COE</td>
<td>Health Exercise &amp; Sports Science</td>
<td>154</td>
</tr>
<tr>
<td>College Of Education COE</td>
<td>Educational Specialties Ed Spec</td>
<td>148</td>
</tr>
<tr>
<td>College Of Arts &amp; Sciences A&amp;S</td>
<td>Anthropology Department</td>
<td>114</td>
</tr>
<tr>
<td>College Of Fine Arts CFA</td>
<td>Art Art History</td>
<td>107</td>
</tr>
</tbody>
</table>
Note that these data include graduate students at all levels (master’s, doctoral, and certificate programs), some of which do not include a substantial research component. Measures of the number of PhD dissertations produced may provide a better gauge of the extent of the graduate student research enterprise in different units. (See section III.B. below.)

Following is a list of the numbers of graduate students in all Main Campus departments and graduate programs. (Note that the numbers for many departments include students enrolled in various programs. Programs listed separately below are those that are across more than one department or college.)

<table>
<thead>
<tr>
<th>College Of Arts &amp; Sciences A&amp;S</th>
<th>As Biology General Administrative</th>
<th>107</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Of Engineering SOE</td>
<td>Mechanical Engineering</td>
<td>106</td>
</tr>
<tr>
<td>College Of University Libraries &amp; Learning Sciences CULLS</td>
<td>Organization Info Learning Sci-Oils</td>
<td>104</td>
</tr>
<tr>
<td>School Of Engineering SOE</td>
<td>Civil Engineering</td>
<td>99</td>
</tr>
<tr>
<td>College Of Arts &amp; Sciences A&amp;S</td>
<td>English Department</td>
<td>92</td>
</tr>
</tbody>
</table>

Table C 4: Average number of graduate students enrolled in departments or interdisciplinary programs, calculated over fall 2014, fall 2015, and fall 2016 semesters.

III. Relating Numbers Of Faculty In Departments To Size Of Graduate Programs

A. Numbers of faculty and numbers of graduate students

Issues: There are numerous issues in attempting to relate the data on faculty numbers and the data on graduate student numbers.

• While some departments offer a single graduate program (or at least, one that appears under a single name in the data), many offer multiple programs. This seems to be particularly true in the College of Education. This means that the number of graduate students served by these departments must be calculated by summing the numbers from the various programs. A simple example is the Department of Spanish & Portuguese, whose programs are listed as “Spanish”, “Portuguese”, and “Spanish and Portuguese”.

• Some graduate programs are affiliated with more than one department or college. Examples include “Nanoscience and Microsystems Engineering”. Thus it is not possible to relate the numbers of students in these programs to the number of faculty in any particular department.

• Some programs are affiliated with multiple departments across two or more colleges. This is true, for example, of “Optical Science and Engineering”, “Latin American Studies”, and “Educational Linguistics”. This creates the same issue as above.

• The Water Resources Program is housed in Graduate Studies, not in an academic department.
Data massaging: The following choices were made in working with these data for the analysis in this section. These choices were made purely to simplify the analysis; they are not intended to express any judgment.

1. The following programs were excluded because their faculty belong to multiple departments, or in some cases multiple colleges / schools:

2. “Educational Linguistics” was included in Language, Literacy, and Sociocultural Studies, because that is its administrative home, although the program also includes faculty in other departments in the College of Education and the College of Arts & Sciences.

3. Six faculty members are listed as "Chemical Nuclear Engineering". They were excluded from the analysis as it was not apparent how to associate them with a specific graduate program.

4. Other programs were assigned to the departments that house them, and the numbers of students totaled for each department.

5. The following units have faculty assigned to them, but there was no data on graduate students for them:
   - Anderson Schools of Management, School of Law, Honors College, University College, and the research centers under the OVPR.

![Graph comparing total number of graduate students in programs affiliated with a department, to number of research-active faculty in that department.](image-url)

*Figure C 1: Graph comparing total number of graduate students in programs affiliated with a department, to number of research-active faculty in that department.*
B. Numbers of faculty and numbers of theses and dissertations

An additional analysis was done of the numbers of Masters theses and PhD dissertations produced in different Main Campus graduate programs. This analysis is based on data provided by the library of theses and dissertations stored in LoboVault. The data set consists of all those submitted from January 2009 – August 2016. Note that some departments did not confer doctoral degrees during this time period.

The ten programs with the largest number of PhD dissertations during this period are shown in the table below.

<table>
<thead>
<tr>
<th>Program</th>
<th>Number Of PhD Dissertations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical And Computer Engineering</td>
<td>120</td>
</tr>
<tr>
<td>Psychology</td>
<td>79</td>
</tr>
<tr>
<td>Anthropology</td>
<td>70</td>
</tr>
<tr>
<td>Biology</td>
<td>69</td>
</tr>
<tr>
<td>Physics &amp; Astronomy</td>
<td>68</td>
</tr>
<tr>
<td>Communication And Journalism</td>
<td>54</td>
</tr>
<tr>
<td>English</td>
<td>53</td>
</tr>
<tr>
<td>Language, Literacy, And Sociocultural Studies</td>
<td>53</td>
</tr>
<tr>
<td>Computer Science</td>
<td>51</td>
</tr>
<tr>
<td>History</td>
<td>51</td>
</tr>
</tbody>
</table>

The ten programs with the largest number of Masters theses are shown in the table below. Note that in many programs, few or no Masters students write theses; rather, they complete a comprehensive exam or a capstone project.

<table>
<thead>
<tr>
<th>Program</th>
<th>Number Of Masters Theses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Engineering</td>
<td>93</td>
</tr>
<tr>
<td>Psychology</td>
<td>70</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>62</td>
</tr>
<tr>
<td>Earth And Planetary Sciences</td>
<td>56</td>
</tr>
<tr>
<td>Biology</td>
<td>48</td>
</tr>
</tbody>
</table>
A further analysis was done to relate the numbers of theses and dissertations (combined) to the number of faculty in departments. Graduate programs in Biomedical Engineering, Latin American Studies, Nanoscience and Microsystems, and Optical Science and Engineering were excluded from this analysis because they are highly interdisciplinary and cannot be meaningfully associated with any single department. For departments whose faculty contribute to these programs, this will have the effect of appearing to reduce the number of theses and dissertations.

IV. Dissertation abstracts
The library [thanks to Karl Benedict and Kevin Comerford] provided the texts of the abstracts from all dissertations submitted during the period 2009-2016. These were analyzed to identify the most frequently occurring terms, which should relate to subject areas that are frequently chosen as the topic of dissertations. Note that dissertations in Health Sciences programs are included in these analyses and displays.
Words that were not likely to be informative were excluded from the analysis: this includes both very common words (“the”, “and”, etc.) and also words that commonly occur in academic writing. After these exclusions, the most common 1-, 2-, 3- and 4-grams were determined. Displays (“Wordles”, http://www.wordle.net/) of the 2- and 3-grams are provided here. These displays show the most frequent terms in larger print.

Further exclusions were made to generate these plots.

2-grams: The basic data set consisted of all 2-grams with frequency greater than 10. Several 2-grams consisting of numbers were deleted from the list. Also excluded were 2-grams including the word “dissertation” preceded or followed by a word like “examines” or “presents”, as these were deemed uninformative.

The 2-gram “United States” was by far the most frequent in the data set, occurring 254 times. (The next most frequent was “Rio Grande”, occurring 101 times.) “United States” was excluded from the display because in order to accommodate such a frequent phrase, the plotting program makes all the other words too small to read.

The resulting display of 2-grams:

3-grams: All 3-grams with frequency of five or greater were collected. The display below excludes the most frequent, “southwestern United States” (occurring 41 times), for the same reason that “United States” was excluded from the 2-grams. The second most
frequent 3-gram was “sp n. a.”, occurring 38 times. This was also excluded from the display. The most frequent 3-gram included in the display is “magnetic resonance imaging”, which occurred 23 times.
V. Research Awards

Data on research awards for FY16 was provided by Contract and Grant Accounting. In the analyses reported here, only the 842 awards with a positive amount of funding were included. (The original data included 286 no-cost extensions, non-disclosure agreements, and other "awards" that do not represent new funding amounts, and 30 awards listed as having negative amounts.) Awards to branch campuses and their units (e.g., the Harwood) were excluded.

These data are categorized by the administrative unit that manages each award. Funding was awarded to 83 different units.
Units with the largest monetary amounts awarded were:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Total Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVPR EPSCOR</td>
<td>12,703,385.00</td>
</tr>
<tr>
<td>Biology Department</td>
<td>12,661,897.10</td>
</tr>
<tr>
<td>CE-Externally Funded Programs</td>
<td>10,092,606.00</td>
</tr>
<tr>
<td>Electrical Computer Engineering</td>
<td>9,062,923.82</td>
</tr>
<tr>
<td>Computer Science</td>
<td>6,710,620.00</td>
</tr>
<tr>
<td>CASAA</td>
<td>6,284,017.00</td>
</tr>
<tr>
<td>Meteoritics</td>
<td>5,925,427.00</td>
</tr>
<tr>
<td>Center for High Tech Materials CHTM</td>
<td>5,803,311.00</td>
</tr>
<tr>
<td>Ctr for Micro Engineering Materials</td>
<td>4,262,010.00</td>
</tr>
<tr>
<td>Physics Astronomy Department</td>
<td>3,608,061.00</td>
</tr>
<tr>
<td>Chemistry Department</td>
<td>3,509,928.00</td>
</tr>
<tr>
<td>Center for Water &amp; the Environment</td>
<td>3,364,155.00</td>
</tr>
<tr>
<td>COE Administration</td>
<td>3,061,158.00</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>2,985,322.00</td>
</tr>
<tr>
<td>Institute of Public Law</td>
<td>2,893,393.00</td>
</tr>
<tr>
<td>Center for Emerging Energy Technolo</td>
<td>2,248,789.00</td>
</tr>
<tr>
<td>Chemical and Biological Engineering</td>
<td>2,149,955.00</td>
</tr>
<tr>
<td>Earth and Planetary Sciences Dept</td>
<td>2,072,694.83</td>
</tr>
<tr>
<td>COSMIAC</td>
<td>1,990,735.52</td>
</tr>
<tr>
<td>Nuclear Engineering</td>
<td>1,690,390.00</td>
</tr>
</tbody>
</table>
Units with the largest number of awards: (Although one PI may have numerous awards, a larger number of awards tends to indicate a larger number of different individuals receiving research funding.)

<table>
<thead>
<tr>
<th>Unit</th>
<th>Count Of Grants Funded FY16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology Department</td>
<td>99</td>
</tr>
<tr>
<td>Electrical Computer Engineering</td>
<td>49</td>
</tr>
<tr>
<td>Physics Astronomy Department</td>
<td>39</td>
</tr>
<tr>
<td>CASAA</td>
<td>38</td>
</tr>
<tr>
<td>Center for High Tech Materials CHTM</td>
<td>37</td>
</tr>
<tr>
<td>Ctr for Micro Engineering Materials</td>
<td>31</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>27</td>
</tr>
<tr>
<td>COSMIAC</td>
<td>26</td>
</tr>
<tr>
<td>Maxwell Museum Department</td>
<td>24</td>
</tr>
<tr>
<td>Computer Science</td>
<td>22</td>
</tr>
<tr>
<td>Nuclear Engineering</td>
<td>22</td>
</tr>
<tr>
<td>Center for Water &amp; the Environment</td>
<td>21</td>
</tr>
<tr>
<td>Chemistry Department</td>
<td>19</td>
</tr>
<tr>
<td>Earth and Planetary Sciences Dept</td>
<td>19</td>
</tr>
<tr>
<td>KNME Operations</td>
<td>18</td>
</tr>
<tr>
<td>Ctr for Education Policy Research</td>
<td>17</td>
</tr>
<tr>
<td>CE-Externally Funded Programs</td>
<td>15</td>
</tr>
<tr>
<td>Inst for Policy, Eval &amp; Applied Res</td>
<td>15</td>
</tr>
<tr>
<td>Psychology Department</td>
<td>14</td>
</tr>
<tr>
<td>Sociology Department</td>
<td>14</td>
</tr>
</tbody>
</table>
Appendix D: Summary Of Prior Reports
Summaries of A&S hiring plans, ADR 2015 surveys, the Community Engaged Research plan, and the Provosts 2013 Interdisciplinary Report are available here: https://docs.google.com/spreadsheets/d/1DASyUzBM3YoTLyfrV2g4Gym09u5FLEj0mG1yxf1Nw7k/edit?usp=sharing

Appendix E: Recommendations From Interviews, Surveys And Prior Reports

Recommendations 1. From Interviews

- Support excellent research & improve the research process
- Capture what faculty do in systematic way
- Find ways to identify and communicate excellence “that is so ubiquitous and obvious that it’s almost like seeing air”
- Build our New Mexico related research so that it can have a national impact, rather than just local.
- Focus on key opportunities: we sometimes dilute what we’re really good at by trying to do everything?
- Leverage our diversity
- Find ways to reward faculty who want to undertake research initiatives
- Faculty mentoring to teach the fundamentals of research. For example, consistency & showing impact are markers of successful research.
- Become more nimble in obtaining and administering seed funds can be obtained from small grants, private donors, and foundations. RAC (at the VPR level) and Humanities Working Group Seed Funds (in A&S) are two ways to get funding for new initiatives, Research Allocation Grants (?) in COE.
- We need consistency in administration to work with research labs. There should be a strategy to have young faculty come in to areas where we have marked distinction so that it can continue. For example, UNM has been top in the areas of quantum physics and material science. However, we don’t have a strategy to keep this going. (We were once in the top 3 programs in quantum physics and now we’re in the top 25.)
- Encourage interdisciplinary research
  - We can take simple steps that encourage understanding between units: example a PIVOT training that helps faculty in one unit understand how the rest of the university will view you: update profile
  - Get faculty out of the department/college to communicate with faculty in other departments/colleges.
  - Create spaces that foster interdisciplinary discussions. Create more spaces for collision, convergence, sociability.
  - Bring people who need the same tools into the same structure
- Invest in Cluster hires, particularly in these research areas:
  - Health and prosperity of unique NM populations (leverage that the RWJ foundation has an endowed chair in race and health).
  - Water in the west (this was attempted in 2013 and not executed due to lack of funds)
  - Renewable energy technology (building on EPSCOR efforts)
- Consider a Dean of interdisciplinary studies
- Minimize structural barriers to success
The chain of command must have a consistent message, or several succinct messages, not a dozen.

Anytime you add requirements remove one (don’t over-regulate)...UNM is too focused on legal liability

create expedited ways to get course codes listed across departments

- Find ways to quantify research excellence that are metrics-based but multivariate.
- Funding is the dominant metric in science and engineering, but not in the Arts and the Humanities and Education. Not all disciplines need funding to produce excellent scholarship.
  - The impact of education research goes beyond quantitative metrics such as graduation rates and grades; develop ways to measure and encourage wider impacts of education research
  - The National Endowment for the Arts (NEA) has two primary criteria for arts funding 1. Artistic Excellence; and 2. Artistic Merit. NEA Chair Jane Chu added the following: 1. Cultural preservation; 2. Cultural transmission and 3. Having the highest level of professional involvement demanding artistic rigor.
  - For science and engineering, consider cumulative citation counts, h-indices or other impact factors for departments and centers to see where UNM research is having high impact. This is not a sufficient metric, and it is not applicable to humanities, arts and education where research metrics are less easily quantified, but it is a good coarse grained way to see impact in technical fields (i.e., CHTM reports a cumulative h index of 90) through web of knowledge or google scholar. Promote and invest in departments and centers that have had high impact.
  - Identify specific research areas for investment
  - New seed funding is needed for large-scale, general interdisciplinary research.
  - More seed funding for technology transfer from industry and government sources.
  - Neuroscience is an untapped area between main campus, the Mind Research Network and HSC.
  - Rotate what you are investing in (e.g. engineering, arts, etc).
  - Focus on problems vs solutions (technologies)
  - Native American Studies is an area of tremendous, untapped potential. "Indigenous design" is one of the first such programs in the world.
  - Develop interdisciplinary research centers based on fundamental questions; centers should support faculty through proposals, pre- and post-award
  - Encourage more clinical and applied research: examples in COE: effect of health and exercise on learning, clinical research in COE
o Develop basic science and health science linkages. Strongest connection is engineering and health science. Really the only concerted effort, could be more work between CASAA, Psychology, Biology, and Health Science.
o We should pursue health policy, especially in health disparities
o More work in Computer Science, particularly computer security, and Internet of Things.
o We need consistency in administration to work with research labs. There should be a strategy to have young faculty come in to areas where we have marked distinction so that it can continue. For example, UNM has been top in the areas of quantum physics and material science. However, we don't have a strategy to sustain excellence. We were once in the top 3 programs in quantum physics, but we have dropped in the rankings.
o Leverage existing resources & Potential Partnerships External (funders and institutions)
o Leverage relationships and potential partnerships with the national laboratories (Los Alamos Air Force Research Lab and Sandia) for unique opportunities for research and research funding, and research collaborations (lots of data scientists at LANL want UNM partnerships). An example is to leverage our connections to labs in ecological research, climatology and high performance computing to develop where climate models. However, we have little work on how we might use technology to solve the climate change problems.
o More joint applications for federal and foundation funding. UNM can be an attractive partner given its location and designation as a high Hispanic-serving and high Indigenous-serving institution.
o Make connections with institutions participating in large initiatives (e.g. manufacturing center w/ California & NY was funded at $100 million. More efforts to leverage these larger collaborations/consortia.
o Build on the success of the Faculty Research Development Officer (FRSO) model which is yielding benefits. Explore opportunities to pool resources among departments and colleges and explore how pre-award and post-award can optimize use of research administration talent.
o Suggested strategies for creating productive research environments
  • Develop more effective large research centers at UNM by removing barriers to success. Category III Centers have led to excellent research, but we need to remove complicated budgetary relationships among Centers and academic units and lower the barriers to collaboration between affiliated centers like the Mind Research Network.
  • More joint hires across disciplines to support interdisciplinary research
  • Collaborations with the Health Sciences Center, particularly Cancer Research Center and other basic cancer research
  • One-stop structural organization within our colleges that supports better communication with faculty about their research
Inclusive Excellence (defined by the University of Denver statement) is the recognition that a community or institution's success is dependent on how well it values, engages and includes the rich diversity of students, staff, faculty, administrators, and alumni constituents. More than a short-term project or single office initiative, this comprehensive approach requires a fundamental transformation of the institution by embedding and practicing IE in every effort, aspect, and level of a college or university. UNM should use the Inclusive Excellence framework to transform how it values and promotes research.

- Facilitate more faculty-led initiatives which almost always work better than top-down driven programs.
- Identify potential synergy across departments and units and provide staff and technical support to coalesce research efforts, such as in the Center for Stable Isotopes, and proposed centers in Bioinformatics and Genomics and Spatial Data Analysis.
- Provide seed funds for collaborative faculty groups, most notably in Humanities (NEH-LSI working group), Nextgeneration PhDs in Humanities.
- Institutionalize key resources for multi-investigator efforts. Right now we are looking to create a program office for multidisciplinary training grants, and core strength in research computing.
- Develop broader and more meaningful connections between Natural and Social Sciences and Humanities, probably surrounding critical problems like water availability, borderland issues, etc.
- Generate Faculty excitement and sustained effort. We convened a symposium recently to ask faculty to present their research in lightning talks and do group discussions about topics, synergy, and future directions in A&S.
- Potential Partnerships External (funders and institutions)
- Current and future relationships and potential partnerships with the national laboratories (Los Alamos National and Sandia) present unique opportunities for research and research funding.
- More joint applications for federal and foundation funding. UNM can be an attractive partner given its location and designation as a high Hispanic-serving and high Indigenous-serving institution.
- Connections with institutions participating in large initiatives (e.g. manufacturing center w/ California & NY was funded at $100 million. More efforts to leverage these larger collaborations/consortia.)
Recommendations 2: From Surveys (focused on Criteria)

- **CETI - Center for Evolutionary and Theoretical Immunology**: Research receives remarkably little attention at UNM. Much, much more needs to be done to support the activities of PIs that work so hard to generate the proposals that support the entire enterprise. They are the real heroes at UNM because they are often the superb teachers as well. UNM has a long way to go to make their community of researchers feel better in their interactions with the administration. Imposition of inviolable deadlines regarding submission (often well before agency deadlines), abrupt treatments and decisions from administrators perceived to have little knowledge of and talent for research really rankle. Researchers are the ones with the exceptional talents that UNM must figure out how to absolutely cherish, and preemptively support including with salary increases, or we will lose them to more research-friendly environments.

- **EPSCoR/DataONE**: Research excellence at UNM seems to be recognized when it is good research focused on a narrow, disciplinary topic. I do not believe that large, transdisciplinary and interdisciplinary research projects are valued to the same extent that they are at most major top-flight research universities.

- I am uneasy about the continued efforts to measure research productivity as the metrics often seem to be one-sidedly favoring stem disciplines. In our department, we also do research has may not have a new and unique quality but provides a public service in editing texts, translation, book reviewing for academic journals, writing encyclopedia entries, etc. All of these activities contribute to our discipline and its success, including the students', but do not get measured by strict book or scholarly article metrics and thus fail to capture adequately what we do. Therefore, instead of trying to force every discipline on campus into the same rubrics, compare apples to apples and not apples to oranges.

- **Maxwell Museum of Anthropology** is a non-academic unit; to the extent that staff teach or serve on committees, they do so through overlapping or adjunct appointments in academic departments. That causes us to have a low profile internally, since so much of UNM's introspection starts with the assumption that there are academic units and there are 'support' units. But we do original research! And we do involved students in that research!

- Include training high school and undergraduate students in research as a legitimate research activity, and recognize the excellence of such programs at UNM.

- Do not use "one size fits all" frameworks to evaluate research

- Encourage fairness in supporting and evaluating research at all levels (chairs, deans, OVPR)
Recommendations 3. From Prior Reports

Ways to support excellent research & improve the research process

- Hire across departments in a synergistic way; enhance communication within and among principal investigators to identify emerging areas; conduct research symposia
- Collaboration and coordination across groups and departments; trans-disciplinary research, education, and graduate training proposal development
- Provide University funded grants for interdisciplinary public scholarship
- Provide resources for ongoing support of community and university members to formulate and advance collaborative research initiatives.
- Building institutional commitments to service learning, civic engagement as an integral component of faculty research.
- Establish doctoral level internships with community non-profits with a CES focus.
- Shift and revise the professional reward structure and practices so that a diversity of routes to academic excellence and innovative forms of scholarship is possible for faculty; structures that “support engagement rather than disdains it.”
- Explicitly recognizing community-engaged scholarship as scholarship.
- Offer Fellowships for graduate students and postdocs from underrepresented groups, as most tier 1 research universities do.
- Education initiatives that discuss race, class and gender issues improve success and retention of underrepresented students and faculty. Invest in research and education on these topics.
- Need “articulated procedures and policies available to faculty who wish to establish interdisciplinary study programs” as well as administrative and financial support. Overcome Obstacles 1. Rigid organizational structure and administration silos 2. Inflexible course and degree requirements that inhibit approval of new courses 3. Department/discipline-centric hiring and promotion guidelines 3. Inadequate funding and ongoing support for ID programs at all levels 4. Marginality of ID research, teaching, service, advising, and mentoring. Develop “An Entrepreneurial Model for the Active Management of ID Programs at UNM”. Explicitly fund ID efforts through University College and OGS. Develop procedures for hiring, evaluating, and promoting ID program faculty and Graduate Degrees in Interdisciplinary Studies.

Specific research areas in which UNM should invest

- D2K - Data to Knowledge Initiative, Bioinformatics, Race and Ethnicity; Water Science and Policy; Earth Systems; Energy Science and Policy; Latin America - Biodiversity, Social Research, Economic Research
- Latin American studies; nanomaterials; learning and well-being of New Mexicans; spatial data analysis research and data visualization; remote sensing and the internet of things; sustainability; high-performance research space for optics and imaging
• Establish a “Community Scholar in Residence” program to support CES sustainability across all disciplines.
• Develop a ladder of early career recognition awards for junior or pre-tenure faculty involved in CES and extending this to more distinguished career recognition awards for tenured faculty research in all disciplines.
• Develop University recognition awards for CES Research Teams to promote interdisciplinary research.
• Existing resources the Research Strategic Plan should use or leverage
• Extensive support for technical staff supported by A&S I&G budget. Extensive network of research infrastructure (FRSOs; Research Analysts in Departments)
• FRDO, FRSO programs; seed monies from RAC, OVPR, and Units; collaborative hires (i.e., across departments and centers) in key research areas (i.e., Bioinformatics); State support for research start-ups
• Alumni organizations
• Community advisory councils
• Leveraging public organizational linkages that exist in the state
• Private foundational support for faculty CES
• Build a coalition of business, non-profit and government leaders to advance a CES focus among IHEs and forge links between academia and the social sector
• Partner with other IHEs to share resources in support of interdisciplinary CES that addresses state-wide issues
Dr. Jeremy Edwards Leading The Human Capital Working Group Discussion:
Members: Jeremy Edwards (Chair), Kiyoko Simmons, Emily Ballo, Rebecca Blum-Martinez (Assoc. Chair), April Davidson, Virginia Scharff, Tim Lowrey, Paul Schwoebel, Julia Fulghum, Kateryna Artyushkova,
GOALS

The goal of the Human Capital Working Group is to examine relevant data on faculty and staff to develop a comprehensive plan to create and sustain a dynamic, diverse, and effective research work force. We were also charged with developing an incentive plan to encourage maximal productivity from UNM researchers with the ultimate goal of increasing sponsored research. More specifically, we will identify the main characteristics of the successful research active faculty and staff.

METHODS

To accomplish our goals, we reviewed selected peer institutions’ incentive programs for faculty and staff. We also examined trends, needs, and opportunities that will lead toward successful recruitment, retention, advancement, and training of our research active faculty, and we investigated the salient variables that are a critical part of creating a culture that continually recognizes and rewards excellence in research and promotes a higher level of achievement. Also, importantly, we identified opportunities for increasing the diversity of our researchers through the recruitment and retention of persons of color and other underrepresented populations.

To accomplish the goals discussed above, we sought to collect data from a number of different sources. The working group then compiled the results from these sources in order to draft this report with specific recommendations.

Data Sources

Interviews.
A key method to collect relevant data was to interview a select group of faculty, staff, and other relevant individuals. The people to be interviewed were selected by the working group (list in Appendix A). We asked the interviewees the following questions:

• What are your perceptions of the research UNM conducts? Do you view our research as excellent relative to our peers or other institutions where you have been?
• Do you think UNM could do more to encourage faculty (postdocs/students/staff) to be more research active?
• How can UNM incentivize research?
• Are you aware of other research incentive programs on campus or off?
• How can we support research of underrepresented faculty at UNM?
- Are there Human Resources policies related to research faculty, staff or students that impede or deter researchers from conducting research? If yes, identify the policies and how they could be improved.
- What additional comments do you have?
- Do you have any questions for me?

**Surveys.**
Survey questions related to Human Capital concerns were included in a faculty-wide survey that was sent out in December 2016. The response rate for the survey was 13% (275 individuals responded). The survey questions were:
- Should UNM provide its faculty with more incentives for research involvement and productivity?
- Should UNM do more to encourage unfunded research?
- Do aspects of your current research involve undergraduate or graduate students?
- Do new junior faculty in your unit receive sufficient support for research, including startup funds?
- Should UNM pursue more cross-departmental appointments?

Results and impressions of the research survey are included as Attachment B.

**FINDINGS**

Recognition of research excellence can be one of the best incentives for faculty to engage in high quality research. For example, internal awards for faculty that have achieved research excellence is a great motivator, and it improves the morale of campus researchers.

Publicizing outstanding research contributions is an effective means to incentivize researchers. Most researchers are already highly motivated by their peers and professional societies. However, being recognized locally is a great way to further motivate researchers. This has the additional benefit of increasing our profile locally, which could lead to increased state-level funding for our research.

Time is possibly the most valuable asset. Research productivity of our faculty could be greatly increased by provided more time to the researchers. How could the VPR provide researchers more time? The people interviewed overwhelmingly suggested more administrative support for the researchers. It would be great to remove many of the administrative burdens on research active faculty. Many items were cited, but primary
burdens were (1) effort certifications, (2) travel reimbursements, (3) chemical inventories and (4) equipment inventory.

Time for research is especially valuable. Incentives for research should primarily be in the form of time releases. Reduced teaching loads for the most active research faculty is highly supported by the people polled by the interviews. Additionally, ways for less research active faculty to be given course releases to ramp up research activities was highly encouraged.

It is harder for social science research to attract external funding. Some highly influential social science research can be done with very little funding, and UNM could develop a small fund to support highly influential research that would not be too expensive. Social science researchers have a difficult time finding the time to write grants that may provide scant funding. Administrative support for writing grants would be helpful, as would assistance with finding funding sources that might be fruitful. Of special note for social science researchers was the lack of sufficient technology support. Because social science research does not bring in large sums, computers and other technology support is terribly outdated and prohibits researchers from accessing up-to-date data sources. Social science researchers also mentioned that they were spending their own money to travel to libraries and other institutions that house important documents. Students involved in unfunded research can be supported internally by UNM.

Joint (or secondary) appointments are a good idea. However, these appointments need to be real. The appointments will work when all expectations are defined at the time of the appointment. Clear specification of review and assessment structure should be in place. For example, the U. of Washington goes as far as to define the T&P committee that will evaluated the faculty member. This T&P committee will consist of members from both departments, but prevents the faculty member from being evaluated separately by two different committees.

Some faculty are highly supportive of flexible appointments, and others are not. It is our finding that overall flexible appointments could be a major benefit for UNM faculty, and the impact of flexible appointments on the faculty that do not like the idea is minimal. We also find that flexible appointments are an outstanding incentive for research active faculty. Faculty can take advantage of a flexible appointment in a number of ways. For example, external federal funding can be used to pay salary for protect more time for research, or faculty can be encouraged to interact with the private sector via a flexible appointment. The flexible appointment option is also a great retention tool for highly productive faculty members.
Research active faculty from departments (or centers) with good administrative support felt that the Office for Sponsored Research functioned well, whereas many faculty from departments without adequate support felt the opposite. Therefore, we conclude that administrative support to assist with proposal preparation, and other issues associated with external funding, will greatly improve the productivity of our research active faculty. Support groups for underrepresented faculty is a vital component to ensure the success of highly talented underrepresented faculty. The U. of Washington set up a support system for junior women faculty. The support group met monthly during lunch, and the Provost funded this activity. Senior faculty basically mentored and supported the women faculty. The ADVANCE staff setup interest groups for all new female faculty, to setup and facilitate support groups. Having groups of young faculty, that are all dealing with the same issues helps deal with the associated problems. Senior faculty involvement was critical and this established a highly effective mentoring activity. The involvement of groups like this helps solve the root problem, which is hiring more underrepresented faculty.

National Lab retirees are a tremendous resource that is, under-utilized. Many remain in the Albuquerque area and are interested in continuing to work in research but with significantly reduced time and paper-work commitments. Sandia does essentially nothing to take advantage of this resource – people that are often highly motivated, experienced, and competent, and often leaders in their research areas. UNM could actively encourage and provide a formal mechanism for these people to work in some capacity with research groups at UNM. The benefits to UNM could be multifold, to include, enhanced research productivity and better connections with Sandia - something both UNM and Sandia have struggled with for years with only limited success. Lastly, unforeseen benefits will come with such broadening of UNM research activities and capabilities.

Similar comments can be made concerning retired Sandia upper management, which could be utilized extensively to advise the research enterprise at UNM. As you know, the upper management is often very well connected within DOE, DOD, and the US Government. Many, we are sure, would be happy to volunteer their time to help UNM.

ACTION PLAN

The above findings suggest that UNM embark on the following four strategic objectives and their associated tactics to achieve the goal of developing a comprehensive plan to create and sustain a dynamic, diverse and effective research workforce.
Objective 1: Recognize and publicize research contributions and research excellence.

Task 1.A. The OVPR will highlight researcher activities on the OVPR website home page with updates made monthly. The OVPR will also create and send out press releases to media to enhance awareness of the breadth and depth of research taking place at the university. Those researchers for whom a press release is submitted will also be invited to a hosted lunch with their ADR and the VPR/AVPR.

Metrics: Enhanced awareness of research activities both internally and externally as assessed on an annual basis through a Research Strategic Plan survey.
Timeline: The new OVPR website will be launched spring FY2017 with researcher highlights. The Community and Outreach Specialist in the OVPR will develop press releases with researchers and send them out to appropriate media outlets. The VPR/AVPR will host lunches with those researchers for whom press releases/highlights are initiated.

Task 1.B. The OVPR will work with the Research Policy Committee (RPC) to enhance the Annual Research Excellence Awards program to include additional categories (e.g., interdisciplinary research, non-senior award categories). The OVPR will set up a plan with RPC, develop and/or update the application and request nominations. The RPC will review the nominations and determine awardees. The OVPR will host an award ceremony to recognize the awardees. A reception for PIs will be held following the ceremony. In addition, the OVPR will review with the RPC the possibility of adding a monetary component to the award.

Metrics: Enhanced recognition for outstanding research achievements as assessed on an annual basis through a Research Strategic Plan survey. Also, a trajectory in number and diversity of nominations.
Timeline: The OVPR will engage with the Research Policy Committee to expand the Annual Research Excellence awards in spring FY2017. The first award ceremony will be held Spring 2018.

Task 1.C. The OVPR will engage the UNM Alumni Association to explore the possibility of creating a research related award.

Metrics: Enhanced recognition for outstanding research achievements as assessed on an annual basis through a Research Strategic Plan survey.
Timeline: The OVPR will engage the UNM Alumni Association Fall FY2018.

Objective 2: Identify And Assist In Providing More Time For Researchers To Conduct Their Research.
Task 2.A. The OVPR will convene a task force to study how research administrative support is allocated throughout campus. The task force will identify opportunities for additional administrative support for researchers. The task force will present these opportunities and other recommendations to the VPR for evaluation and resource allocation.

   Metrics: Reduced administrative burden to researchers, which will allow researchers to dedicate more time conducting research.
   Timeline: The task force will be established in the spring of FY2018. The task force report and associated recommendations will be submitted to the VPR for evaluation by the end of fall FY2018.

Task 2.B. The OVPR will allocate funds – initially up to $30K/year – for course release for main campus researchers and will work with the Research Allocation Committee (RAC) to set up equitable means for awarding these funds.

   Metrics: An increase in the number of research proposals and awards received because of course release. This program will be reviewed annually by the OVPR and the fund may be increased or decreased based upon success of the program.
   Timeline: The OVPR will work with the RAC to set up equitable means for awarding course release funds beginning in fall FY2018. The first opportunity to apply for course release award funds will be during the FY2018 RAC season.

Task 2.C. The OVPR will allocate seed funds (initially $20K/year) to support fields with limited external funding and will work with the Research Allocation Committee (RAC) to set up equitable means for awarding these funds.

   Metrics: An increase in the number of research projects enabled because of the seed funding. This program will be reviewed annually by the OVPR and the fund may be increased or decreased based upon the success of the program.
   Timeline: The OVPR will work with the RAC to set up equitable means for awarding course release funds beginning in fall FY2018. The first opportunity to apply for course release award funds will be during the FY2018 RAC season.

Task 2.D. The OVPR will work with the Office of Graduate Studies to develop a pilot program where graduate students with expertise in proposal writing will provide proposal writing support and training for departmental research involving graduate student researchers.

   Metrics: Graduate student researchers receive training on proposal writing and administrative burden for the conduct of the research is reduced. The OVPR will assess the success of the pilot program in coordination with the graduate studies program.
Timeline: Discussion about the logistics of the pilot program will be conducted spring FY2017 with the goal of implementing the program spring FY2018.

Objective 3: Foster an environment of support and mentorship with the research community.

Task 3.A. The OVPR will develop a mentorship / support program for junior faculty and underrepresented faculty members. A database of volunteer expert, senior level faculty and national laboratory retirees will be established to support this program. A member of the Faculty Research Development Office will manage the database, serve as program coordinator and will work with the ADVANCE program. Program will sponsor events to create awareness and support mentorship and support activities.
   Metrics: Junior and underrepresented faculty will be surveyed (in the annual RSP survey) to determine the effectiveness of the program.
   Timeline: The mentorship / support program will be developed and implemented by fall FY2019 and will be assessed annually.

Task 3.B. The OVPR will explore opportunities to leverage expertise from National Laboratory retirees (both researchers and senior managers). Contact information for any identified individuals who have expressed an interest in collaborating with or providing mentorship for UNM researchers will be entered in the database for the mentorship/support program (Experts Registry) and the database will be made available to the institution through the OVPR website.
   Metrics: Increased engagement with local human resources outside of UNM.
   Timeline: The OVPR will attempt to identify appropriate National Laboratory experts that are interested in participating in this program beginning in Fall FY2018. The database will be established by fall FY2019 and the effectiveness of the initiative will be assessed annually.

Objective 4: Create a task force for the establishment of incentives for research excellence.

Task 4.A. The Provost will convene a task force to establish and implement a policy for salary incentives for research active faculty.
   Metrics: Participation of faculty in incentive program(s). Department Chairs and Center Directors will be surveyed to determine if the faculty are taking advantage of the available incentives.
   Timeline: The task force will be established by the end of FY2017. The associated policies will be implemented by the end of FY2018.
Task 4.B. The task force will consider means to normalize flexible appointments across colleges as a way to incentivize research.
   Metrics: Promulgation of normalized, flexible appointment policy. Department Chairs and Center Directors will be surveyed to determine if the faculty are taking advantage of the available incentives.
   Timeline: The task force will be established by the end of FY2017. The associated policies will be implemented by the end of FY2018.

Task 4.C. The task force will develop a plan for future cross-department appointments (joint/secondary appointments; cluster hires) that includes promotion and tenure considerations.
   Metrics: Enhanced number of cross-department appointments. Department Chairs and Center Directors will be surveyed to determine if the faculty are taking advantage of the available incentives.
   Timeline: The task force will be established by the end of FY2017. The associated policies will be implemented by the end of FY2018.

Task 4.D. The task force will explore the possibility of providing options in the honorific titles given to distinguished professors.
   Metrics: Guidelines are developed and provided for distinguished professors to allow him/her to select honorific title.
   Timeline: The task force will be established by the end of FY2017.
Appendix A.
The individuals we interviewed for the Human Capital Working Group Report:

**Research Area #1**  
Andrew Sandoval-Strausz, Hist  
Jennifer Denetdale  
Jesse Aleman, English

**Research Area #2**  
Greg Cajete  
Felipe Gonzalez  
Sylvia Celdon-Pattichis, Ed

**Research Area #3**  
Abhaya Datye, CBE & CMEM  
Steve Brueck, CHTM  
Stephanie Forrest, CS

**Research Area #4**  
Brian Goldstein, Arch  
Yael Cannon, Law  
Nick Flor

**Administration**  
Carol Parker, Sr. Vice Provost  
Melissa Vargas, Provost Chief of Staff  
Marie Chestnut, Dir, HSC Faculty  
Contracts

**Deans**  
Tom Turner, ADR A&S  
Kym Pinder, Dean Fine Arts  
Christos Christodolou, ADR Engineering

**Individual interviews.**  
Kevin Malloy  
Mike Dougher  
Rosa Gonzalez-Rosenblatt, OSP  
Glenda Lewis, Pres GPSA, Ed

**National Lab People**  
Roger Hagengruber

**VP Research for other institutions.**  
Dr. Mary Lidstrom, University of Washington.  
Dr. Roberto Osegueda, University of Texas-El Paso  
Dr. Marsha Mallick, University of Wisconsin
Appendix B – Response Summary of Human Capital Questions from RPS Survey

Question 95. Should UNM provide its faculty with more incentives for research involvement and productivity?

- Responses:
  - YES 89.7%
  - NO 10.3%

- Current state:
  - no incentives
  - model ignores variability in research productivity

- Suggestions:
  - Reducing teaching load
  - Paid summer time
  - Great F&A and IDC returns
  - Providing research opportunities – internal UNM

- Alternative opinions:
  - Compromises quality of teaching
  - May be divisive
Question 96. Should UNM do more to encourage unfunded research?

- YES 77%
- NO 33%

- Yes, as it leads to funded work, attracts visibility, involves students
- UNM should support by internal funding for students involved in research
- Many are unaware of unfunded research
- Some see it as unlikely successful as need to support time and people from some source
Question 97. Do aspects of your current research involve undergraduate or graduate students?

- Yes, Undergrad 64%
- Yes, Grad 77%
- No – 19%

- Limited funding to involve students is a major obstacle
- Low quality of students is another major factor
- Lack of time for some
Question 98. Do new junior faculty in your unit receive sufficient support for research, including startup funds?

- YES 52%
- NO -48%

- Two major trends:
  - Not enough at all - below average
  - Enough and comparable with other institutions
- Travel support is low, no mentoring and training
- Inequity between junior and senior faculty
Question 99. Should UNM pursue more cross-departmental appointments?

- YES 70%
- NO 30%

- Too complicated – UNM support, clear tenure, review and assessment structure must exist
- Some don’t see the value
- Better to support cross-departmental funding
Appendix C.

**Faculty Research Incentive programs existing at peer institutions:**
Annual one-time research incentive payment.
Cash Prizes for Obtaining Grants of Significant Size or Stature
Salary Replacement Program - budget academic year salary release up to the level required by the department for teaching release.
Post Doctoral Matching Program
Proposal Preparation Incentive
Summer Faculty Fellowships
Independent Research Project Funding Application for Faculty to include Students
Research Project Funding Within a Course
Academic Year Stipends for Students
Student Travel Funds Application
Research Incentive Funds stem from indirect costs recovered from your sponsored project - 5% of their indirect cost recovery available for student support, travel support, hosting collaborators, and computers.
Faculty incentive programs – scholarships, proposal development, campus wide initiative, operating support
Awards for grant submitted ($100-$500)/ awards for grants awarded ($500-1000)
The Research Incentive Funds are returned to the colleges, schools, departments and faculty to incentivize sponsored research program activity.
Internal funding for research seeding, emergencies, time releases, equipment, and student involvement
Course Release Programs
Pre-tenure/Promotion Research release
New Faculty Summer Research Stipends
State initiatives - for example: Texas Research Incentive Program (TRIP)
Research Infrastructure Working Group Discussing Facilities:
Members: Linda Petree, Theodore Jojola (Co-Chair), Joel Straquadine, Abhaya Datye, Emily Ballo, Mary Jo Daniel, Jennifer Kavka, Christopher C. Witt (Chair), Karl Benedict, Katie Witkiewitz, Steve Cabaniss, Kathryn Jacobson.
GOALS

The general goal of this working group is to assess the research infrastructure on UNM Main Campus, and to make recommendations on the basis of that assessment. Research infrastructure comprises facilities, service centers, major equipment, instruments, technologies, and administrative support units that provide or enhance research capability or capacity. Our assessment had four specific goals:

- Identify strengths or components that are important and high quality.
- Identify weaknesses or components that need to be remedied.
- Compare with peers to identify infrastructure ideas that UNM can borrow.
- Identify opportunities for strategic improvements that would enhance research capacity and impact.

METHODS

The working group used two methods of obtaining data in order to assess research infrastructure and formulate recommendations:

Method 1. The primary method was a survey of the Main Campus faculty. The goal of the survey was to capture the perceptions of principal investigators regarding the research infrastructure that supports their work.

Method 2. The secondary method was a set of interviews with individuals responsible for overseeing key components of research infrastructure.

FINDINGS

Survey Results
The survey of faculty was conducted between November 13, 2016 and December 2, 2016. The survey was implemented in the Opinio system and was distributed by direct email to approximately 2100 faculty members. It was targeted at a subset of those faculty members who are based on Main Campus and consider themselves to be research-active. The full text of the survey is provided in Appendix 2. A preamble to the survey explained its purpose to potential respondents. The survey itself consisted of 100 questions: five questions about the respondent's affiliation, rank, and research profile, 80 questions about specific components of UNM's Main Campus research infrastructure, one question about space (quantity, repair, appropriateness), one question about reliance on infrastructure at other institutions, three questions about interactions with the Health Sciences Center (these will be reported on separately by the Health Sciences Center Working Group), five questions about human capital (these will be reported on separately by the Human Capital Working Group), four text-answer questions about general infrastructure issues (strengths, weaknesses, opportunities,
and an open-ended question), and a final question soliciting volunteers for potential follow-up surveys or interviews. Most of the component-specific questions only appeared in a respondent's survey if they selected that component from a list to indicate that they interacted with that particular component; as a result, the surveys were of manageable length.

Some faculty members reported technical problems accessing the survey through the Opinio system, including a repeated problem in which faculty members would log in and, rather than a blank survey, they would find a survey that had already been filled out by a colleague. Despite these problems, the survey received 273 responses. Summary results for each survey question are presented in Appendix 3. Raw data are available upon request from the Office of the Vice President for Research. Respondents were comprised primarily of tenure-track faculty members (~76%) who were almost equally divided among Assistant Professor (n=71), Associate Professor (n=60), and Full Professor levels (n=65). 30 chairs and directors responded (~11% of respondents). The remainder of respondents were (in descending order of frequency): Research Faculty (including Research Professors and Post-doctoral Fellows), Lecturers, and Emeritus Professors. Ninety-eight percent of respondents were from Main Campus, while the remaining 2% were from branch campuses. About 2/3 of respondents indicated that their research was supported by federal funding. Respondents selected an average of 1.8 options each on the funding sources question. After federal funding, the most commonly reported answers were internal UNM funding (33%), foundation funding (23%), unfunded research (22%), state funding (14%), other sources (9%), private funding (7%), community funding (5%), and corporate funding (4%).

Respondents generally considered themselves to be active researchers. Fifty-three percent described themselves as "very active," and 88% described themselves as either "very active" or "active" in research.

Respondents reported 1.26 affiliations each, on average. Approximately 100 distinct affiliations were represented (see Appendix). The most common affiliations were Department of Biology (26), Department of Psychology (18), Department of Physics and Astronomy (13), Anderson School of Management (9), Department of Earth & Planetary Sciences (9), Chemistry & Chemical Biology (8), Computer Science (8), and Electrical and Computer Engineering (8). The next most common 36 affiliations garnered between three and seven respondents each.
Quantitative Survey Results: Faculty Perceptions Of Specific Components Of Infrastructure

The survey asked faculty to select from a list of components to indicate components of UNM's research infrastructure with which they interact. The list was developed by working-group members who attempted to strike a balance between having a list that was reasonably comprehensive and having one that was not too long so as to become unwieldy. The list included various administrative units, centers, and facilities that are important to research at UNM. Once respondents indicated that they interact with certain components, they were then asked to rate those components on a Likert-type scale from one–five (one being the worst and five being the best) with respect to quality, importance, and comparison to analogous components at peer institutions. In Table 1, we summarize the average numerical scores for each component for each of those three rating categories. We also report the number of respondents that reported interacting with each component.
Table 1: Faculty perceptions of quality, importance, and peer-comparison (quality relative to analogous components at peer institutions) for specific components of UNM's Main Campus research infrastructure that are core university services or that serve multiple colleges but are not directly under the control of the OVPR. Mean values of scores (one–five, five being the best) are reported for importance, quality, and peer-comparison, respectively. Components are sorted in descending order of the number of respondents. Components that received fewer than seven responses are not included.

<table>
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<th>Component Name</th>
<th>Responses</th>
<th>Importance</th>
<th>Quality</th>
<th>Peers</th>
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<td>2.8</td>
<td>2.5</td>
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<tr>
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<td>Library Collections: Books, Journals &amp; Databases At Main Campus Libraries</td>
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<td>4.7</td>
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<td>Library Research Support: Reference &amp; Research Data Management Services At Main Campus Libraries</td>
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<td>Safety And Risk Services (SRS)</td>
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<td>Library Instruction: Research, Information Literacy, &amp; Data Management Classes &amp; Training Sessions At Main Campus Libraries</td>
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<td>4.4</td>
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<tr>
<td>Library Spaces: Spaces And Furnishings In Support Of Student And Faculty Research At Main Campus Libraries</td>
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<td>4</td>
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<td>STC.UNM (Formerly Science And Technology Corporation @ UNM)</td>
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<tr>
<td>Library Technology: Includes Computers, Software And Other Technologies In Support Of Student And Faculty Research At Main Campus Libraries</td>
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</table>
### Table 2: Faculty perceptions of quality, importance, and peer-comparison (quality relative to analogous components at peer institutions) for specific components of UNM's Main Campus research infrastructure that are overseen by the OVPR. Mean values of scores (one–five, five being the best) are reported for importance, quality, and peer-comparison, respectively. Components are sorted in descending order of the number of respondents. Components that received fewer than seven responses are not included.

<table>
<thead>
<tr>
<th>Component Name</th>
<th>Responses</th>
<th>Importance</th>
<th>Quality</th>
<th>Peers</th>
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<tr>
<td>Office Of The Vice President For Research (OVPR)</td>
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<td>Conflict Of Interest (COI)</td>
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<td>Faculty Research Support And Development Office (FRDO)</td>
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<td>NM EPSCoR</td>
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<td>Center For High Technology Materials (CHTM)</td>
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<td>4.2</td>
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<td>Export Control &amp; Industrial Security (ECISD)</td>
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<td>Center For Microengineered Materials (CMEM)</td>
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<td>Southwest Hispanic Research Institute (SHRI)</td>
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<td>Center For Policy Evaluation And Research (CEPR)</td>
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<td>Data Observation Network For Earth (DATAONE)</td>
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<td>Geospatial &amp; Population Studies (GPS)</td>
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<tr>
<td>Component Name</td>
<td>Responses</td>
<td>Importance</td>
<td>Quality</td>
<td>Peers</td>
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<tr>
<td>--------------------------------------------------------------------------------</td>
<td>-----------</td>
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<tr>
<td>Sevilleta Field Station (SFS)</td>
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<td>Maxwell Museum Collection (MMC)</td>
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<tr>
<td>Statistics Consulting Clinic (STATS)</td>
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<td>Center For Evolutionary And Theoretical Immunology (CETI)</td>
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<tr>
<td>Center For Stable Isotopes (CSI)</td>
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<tr>
<td>Earth Data Analysis Center (EDAC)</td>
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<td>Center For Biomedical Engineering (CBME)</td>
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<td>Molecular Biology Facility Of The Biology Department (MBF)</td>
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<td>4.1</td>
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<tr>
<td>Building Plans For Physics, Astronomy, &amp; Interdisciplinary Science Bldg. (PAIS)</td>
<td>15</td>
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<td>Center For Water And The Environment (CWE)</td>
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<td>Institute For Meteoritics (IOM)</td>
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<td>Castetter Animal Research Facility (CARF: Biology Dept)</td>
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<tr>
<td>Institute Of Medieval Studies (Medieval)</td>
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<td>4.8</td>
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<td>Pivot Research Funding System</td>
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<td>Department Of Chemistry Analytical Facilities (CHEM,)</td>
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<tr>
<td>Cell Biology Facility Of The Biology Facility (CBF)</td>
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<td>4.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Castetter Hall Greenhouses (Biology Dept)</td>
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<td>4.1</td>
<td>3.6</td>
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<tr>
<td>Center For Emerging Energy Technologies (CEET)</td>
<td>8</td>
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<td>3.9</td>
<td>3.7</td>
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<td>Logan Hall Animal Research Facility (LARF)</td>
<td>7</td>
<td>5.0</td>
<td>3.8</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Table 3: Faculty perceptions of quality, importance, and peer-comparison for specific components of UNM's Main Campus research infrastructure that are located within colleges or departments. Mean values of scores (one–five, five being the best) are reported for importance, quality, and peer-comparison, respectively. Components are sorted in descending order of the number of respondents. Components that received fewer than seven responses are not included.
We used the four data columns in Tables 1-3 to identify infrastructure components that stood out in terms of faculty perceptions of their quality or importance. In order to do this, we used a principal components analysis (PCA), a method that provides a way of visualizing variation in the data by consolidating response variables (in this case, the four variables are consolidated into two)\textsuperscript{58}. When the PCA was used on all 62 components that were rated by at least seven respondents, it revealed that administrative and compliance units are generally perceived as having lower quality than research centers and facilities. That result likely reflects a tendency for researchers to have positive views of places where they generate data, and relatively negative views of units that they associate with rules and forms, and that might contribute only indirectly to their research productivity. Because of this dichotomy, PCA was conducted separately for three categories of research infrastructure components: Core university infrastructure units (Fig. 1), units overseen by the OVPR (Fig. 2), and College- or department-specific units (Fig. 3). Some units were included in multiple categories for the sake of comparison with analogous units. PCA’s for each of these three subsets revealed some clear strengths and weaknesses in the eyes of the faculty.

Among core university units, high perceived importance and quality characterized all the key functions of UNM Libraries, as well as the Center for Advanced Research Computing (CARC), the Office of the Institutional Review Board (OIRB), the Institutional Animal Care and Use Committee (IACUC), the Statistics Clinic, and the Responsible Conduct of Research training program (RCR) (Fig. 1). These results were generally consistent with the qualitative comments, except for OIRB, which received notably mixed reviews in comments, likely due to its recent reorganization. The reorganization of OIRB included a change of leadership that was viewed by many human-subjects researchers as a substantial improvement. The PIVOT research funding database, although apparently well-regarded, received a low response rate (11 responses), perhaps because it is a relatively new system. On the low end with respect to quality and comparison to peer institutions (right side of Fig. 1), ten units stood out: OVPR, OSP, IT, HR, CGA, UCAM, Purchasing, SRS, UNMF, and COI. There was ample support in the qualitative section of the survey to confirm that these units are considered by faculty researchers to be weaknesses in the UNM research infrastructure.

Among units overseen directly by the OVPR, CASAA was an outlier with respect to its high perceived quality and favorable comparison to peer institutions (Fig. 2). Other highly rated units included CBME, SHRI, and CHTM. On the low end of the perceived quality spectrum were DataONE, COI, CEPR, NM EPSCoR, Export Control, and the

\textsuperscript{58} The resulting charts represent less than 100\% of the variance, but this was deemed adequate for our purposes of presenting an initial visualization of the data that could guide development of recommendations based on faculty perceptions of quality and importance of rated units.
Compliance Office. DataONE was subject to a low response rate (7 responses), but comments suggest that its highly funded operation is out of touch with UNM researchers. The Compliance Office oversees both COI and Export Control, so these units can be considered together. The low perceived quality of these units likely reflects the fact that the rules that are tracked and enforced by these units are viewed as tedious barriers to productivity by researchers who are forced to comply. These offices have undergone substantial reorganization in recent years, making ratings potentially misleading; however, evidence uncovered during our interviews (see appendices) suggests that recent changes to the COI process have made it as researcher-friendly and efficient as it could possibly be. NM EPSCoR received modest ratings on 35 responses. CEPR received modest ratings on 14 responses, with comments indicating that this unit was subject to a recent physical dispersal of its researchers to different physical locations on campus, detracting from its effectiveness.

Among centers, institutes, and college- and department-specific components of UNM's research infrastructure, most were perceived as being relatively high in importance and quality. Among the weaker rated units, RWJF stood out by having a very high number of responses (32 total). The survey results provided evidence that certain infrastructure components are strengths in the view of the faculty. The highest rated units included MSB, CSWR, CWE, LAII, CETI, CASAA, CSI, IOM, MBF, and IMS. Additionally, LAII, Sevilleta, and CHTM stood out by having high quality ratings and very high response rates.
Figure 16: Distribution of core university infrastructure components with respect to the number of responses and mean scores for perceived levels of importance, quality, and comparison to peer institutions (based on principle components analysis of scaled and centered variables, with oblique rotation). For abbreviations, see Appendix 1.
Figure 17: Distribution of OVPR-associated infrastructure components with respect to the number of responses and mean scores for perceived levels of importance, quality, and comparison to peer institutions (based on principle components analysis of scaled and centered variables, with oblique rotation). For abbreviations, see Appendix 1.
Figure 18: Distribution of selected centers, institutes, and college- and department-specific infrastructure components with respect to the number of responses and mean scores for perceived levels of importance, quality, and comparison to peer institutions (based on principle components analysis of scaled and centered variables, with oblique rotation). For abbreviations, see Appendix 1.

Qualitative Survey Results: Faculty Perceptions Of Strengths, Weaknesses, & Opportunities

Strengths

Question 91 of the survey asked faculty researchers to list what they considered to be the strengths of UNM’s research infrastructure. This question received 2,909 words of response from 119 respondents. The responses were analyzed to extract specific phrases or references to entities that were perceived to represent strengths of infrastructure, and the number of mentions of each were quantified (Fig. 4).
In a result that might be considered unsurprising, the strength most frequently mentioned by the faculty was the faculty. Although this sounds at first to be a self-serving selection, detailed examination of the commentary reveals that faculty researchers have deep respect for their colleagues, and an intimate understanding of the challenges that they overcome on a routine basis to achieve success and recognition in their disciplines. Comments indicated faculty perceive the road to research success at UNM requires navigating institutional barriers to productivity, at least some of which are unnecessary.

A clear category of strength recognized in different ways by many survey respondents was comprised of the several research centers and institutes that provide high quality infrastructure for research. The support provided by UNM for proposal development, most notably the Faculty Research Support Officers (FRSO's) were frequently mentioned. CARC was cited as a strength by many faculty. Museum collections were frequently cited as strengths, including those of the Museum of Southwestern Biology and Maxwell Museum of Anthropology. Other strengths that were frequently mentioned include the staff for many support units including the libraries, various analytical core facilities, IT, OSP, and OVPR.

Some units were cited as strengths, but also as weaknesses in the following question. The Office of the Institutional Review Board and the Office of the Vice President for Research were each cited as strengths by several faculty who pointed to recent improvements in the administrative structure, transparency, and efficient performance of those units. Furthermore, several faculty respondents pointed to internal research funding as being an essential strength, despite that the plurality of opinion seems to be that there is not nearly enough internal research funding available (see Weaknesses, below). The same could be said of interdisciplinary collaborative opportunities –existing

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**Figure 19:** Strengths of UNM's research infrastructure as identified by faculty survey respondents. Phrases were extracted from raw answers and consolidated around common ideas.
ones are highly valued, but many faculty reported that expansion of such opportunities is urgently needed.

Weaknesses

Question 92 of the survey asked faculty researchers to list what they considered to be the weaknesses of UNM's research infrastructure that were in need of remedy. This question received 5,983 words of response from 133 respondents. The responses were analyzed to extract specific phrases or references to entities that were perceived to represent weaknesses of infrastructure, and the number of mentions of each were quantified (Fig. 5).

The prominent weakness that was recognized by many faculty was insufficient funding support. Faculty cited insufficient funding for many functions that they consider to be core university obligations as well as those that they consider to be efficient investments in research productivity. The degree of state investment in the research mission of UNM is widely viewed as inadequate and insufficient to compete with peer institutions in other states. Weak state funding is exacerbated by poor performance of the UNM Foundation in terms of supporting the research mission.

This weakness in funding is felt strongly in faculty salaries that are lagging behind peer institutions to the extent that even high-performing researchers at UNM are trailing national averages for their title and discipline. The salary problem may be even worse for critical research support staff, for many of whom take-home pay is substantially lower than it was a decade ago because of rising benefit costs and scarce raises. Additional weaknesses that were frequently cited include IT, OSP, general issues with leadership style and short-term planning, OVPR, insufficient investment in maintenance of buildings and other facilities, and a tendency for support units and departments to operate in isolated spheres, or silos, that fail to communicate with each other.

Regarding the latter weakness, several faculty respondents cited the potential for streamlining the proposal development process by breaking down some of the barriers between these silos that they view as unnecessary boundaries between units. A repeated sentiment in the weaknesses section was that UNM's leadership, whether at the OVPR or elsewhere, had often failed to reward or even acknowledge research success. This feeling of lack of recognition could have real consequences if, for example, it exacerbates tensions between PI's and administration over such issues as flexibility with F&A (overhead) policies and proposal submission deadlines.
Figure 20: Weaknesses of UNM’s research infrastructure as identified by faculty survey respondents. Phrases were extracted from raw answers and consolidated around common ideas.

Opportunities
Question 93 of the survey asked faculty researchers to list what they envisioned as opportunities for strategic improvement of UNM’s research infrastructure. This question received 4,075 words of response from 110 respondents. The responses were analyzed to extract specific phrases or references to potential actions that were perceived to represent opportunities for strategic improvement of infrastructure, and the number of mentions of each potential action were quantified (Fig. 6).

The opportunity for infrastructure improvement that was mentioned more than any other involved improved support for PI's at all stages of project development and implementation. Another opportunity that was frequently cited was comprised of various suggestions for improvement of UNM's computational and analytical infrastructure. The latter comments suggested broad recognition by faculty of the emerging importance of 'big data' and computationally intensive analyses for the advancement of their varied disciplines. Further, the faculty recognize that UNM's training programs and computational facilities will both need to improve to meet these emerging opportunities.

Numerous faculty expressed hope that UNM would invest more in facilities upgrades and maintenance, as well as equipment purchases and maintenance to maintain a vibrant research community. Chief among the upcoming investments in facilities is the new building planned for Physics & Astronomy and Interdisciplinary Science (PAIS). Hopes are clearly high for the new building, and respondents from Physics and Astronomy expressed optimism. However, the success of the building may rest on its ability to meet its potential as a hub for interdisciplinary science, and there is substantially more apprehension about that aspect. Clear arguments were made that F&A (overhead) funds are not allocated strategically or fairly among units, a problem
that becomes particularly acute when large overhead packages need to be financed for new faculty hires. Several faculty respondents lamented artificial divisions between some departments and support units. A recurring theme was that funds for pilot projects or to support preliminary data gathering toward a large grant were highly valued, but less available at UNM than at peer institutions. Faculty respondents argued that such 'seed money' is efficiently spent and such programs should be expanded.

In numerous parts of the survey, respondents expressed frustration over a feeling that communication about research was very poor, and that improvements in communication could be a low-cost way to substantially improve the morale, motivation, and effectiveness of faculty researchers. Communication is often inadequate regarding support systems for research, standard procedures, local examples of success, and the long-term strategies of our administrators.

Other repeated themes in the answers for opportunities included the idea of investing in libraries, rewarding research success, removing barriers to collaboration with HSC investigators, and aggressively pursuing private funds for things like endowed professorships that pay enormous dividends for the research mission over the long term.

Figure 21: Opportunities for improvement of UNM's research infrastructure as identified by faculty survey respondents. Phrases were extracted from raw answers and consolidated around common ideas.
Interview findings
Interviews were conducted with key personnel from eleven units. The questions asked in each interview were based on the general questions presented in Appendix 6. Results of the interviews are reported in detail in Appendices 7-17.

Relationship of findings to Environmental Scan
The environmental scan report indicated that there is substantial unpredictability with respect to future opportunities in research funding. This suggests that bottom-up initiatives (those driven by faculty PI's) and recommendations intended to bolster their support systems are ideas that are well suited to the current funding environment.

Relationship of findings to 2007 Research Study Group Report
In 2007, a group of faculty and administrators undertook an effort similar to the current one, but more specifically focused on the proposal development and project administration functions. A survey was issued to faculty investigators to help to understand the strengths and weaknesses of the research project administration process. Interviews were conducted with key personnel. A series of recommendations were issued based on the findings, primarily related to reorganizing the structure of leadership at OVPR, upgrading pre-award and post-award processes, and streamlining compliance. Substantial progress appears to have made over the last nine years since that report, although our survey results reveal that there is work yet to do in these areas.

Strengths
The main strengths are the faculty researchers themselves, as well as the staff research support personnel, particularly at the several highly-active research centers and institutes. Highly regarded units include the FRDO (including the network of individual faculty research support officers, or FRSO's), CARC, OIRB, and the Museum of Southwestern Biology.

Weaknesses
Insufficient funding is perceived as an overarching weakness, but not all weaknesses were attributable to funding shortfalls. Faculty are eager to see a faster pace of improvement in research administration, and better quality support from critical units such as OSP, SRS, and IT. Faculty report siloed support units and departments and ineffective leadership that provides too few incentives for research success.

Opportunities
There is a sense of urgency about emerging opportunities flowing from computational and analytical capabilities, from training to hardware. These could have potential positive impacts on diverse research disciplines at UNM. Barriers can be broken not
only for cost efficiency, but to encourage interdisciplinary collaboration and to simplify the research administration process from the PI's perspective. Investments in bottom-up research initiatives are likely to pay off in multitude ways; such investments in PI-driven research could include expanding the FRSO network, upgrading facilities, funding seed grants, funding equipment repair, and similar actions.

ACTION PLAN

Based on the findings above, we recommend four specific objectives for going forward.

Objective 1: Improve Efficiency Of Research Administrative Services Provided By The Office Of Sponsored Projects (OSP) And Contract And Grants Administration (CGA) And Improve Coordination Between OVPR Research Support (FRDO) And OSP.

Task 1.A: OVPR leadership will provide input into the goals and annual performance review of the OSP Director to ensure a consistent focus on PI/customer service and will meet at least monthly with financial services leadership to review processes.

Metrics: OSP Director achieves or exceeds performance expectations
Timeline: Spring 2017 and ongoing

Task 1.B: The OVPR will engage with the Comptroller to establish a visiting committee to conduct an external evaluation of the processes, procedures, and day-to-day functioning of the OSP by inviting managers from successful Offices of Sponsored Projects at peer institutions. We recommend working with the National Council of University Research Administrators (NCURA) to identify successful leaders of research administration

Metrics: External evaluation completed and report of findings and recommendations submitted
Timeline: End of FY 2018

Task 1.C: The OVPR and OSP will implement and evaluate a pilot project to create full service research support at the college level. Specifically, we propose that one or two CGAs be assigned to work in a college for a six-month trial period with a three-month interim progress report. The CGA would reside in the college office to work collaboratively with the college Associate Dean for Research (ADR), Faculty Research Support Office (FRSO), Fiscal Administrators, and department level grant support personnel to provide inception-to-submission proposal support for PIs and transfer of funded awards to Contract and Grants Accounting. CGAs would still report primarily to
the Office of Sponsored Projects with a secondary report to the ADR. Performance goals will be set jointly and performance evaluations will be completed and signed by both the OSP manager and the ADR. Forms will be implemented to gather feedback regarding the pilot program from PIs, departmental grant support staff, the ADRs, and the CGAs. The impact on OSP will also be evaluated. If determined the model has merit, then the pilot period could be extended to be implemented in other colleges and/or extended to include post-award personnel.

Metrics: Evaluation of pilot completed and value of reorganization determined
Timeline: Fall of FY2018

Task 1.D: The OVPR will work with OSP to evaluate and improve (if necessary) the quality of data and data reporting in Cayuse. The OVPR website will link to the new OSP dashboard.

Metrics: Data in Cayuse is accurate and reliable. Researchers, leadership and administrators can access research award data reports in a timely, efficient manner.

Objective 2: More Efficiently Manage Research Equipment And Facilities And Plan Strategically For Future Needs.

Task 2.A: OVPR will create a standing Large Equipment Advisory Group (LEAG) comprised of representatives of A&S, SOE, Category 3 Centers, and PPG to i) identify significant gaps in research equipment; ii) serve as the Limited Competitions review committee for major instrumentation programs; and iii) serve as the review committee for the internal equipment fund (in 2.B). Members will have staggered terms of 2 years.

Metric: Successful MRI proposals each year; equipment gaps identified are filled, enabling submission of proposals in new areas
Timeline: Committee identified Spring FY2017

Task 2.B: OVPR and LEAG will coordinate the development and annual update of a main campus Research Equipment Inventory of shared-use equipment that will include information about availability, costs, and accessibility of the equipment.

Metric: Inventory completed and use of shared equipment increases.
Timeline: Inventory completed by Spring FY2018

Task 2.C: OVPR and LEAG will reinstate the internal equipment fund (as funds are available) to repair/update key research equipment through a competitive process
following guidelines established by the LEAG and publicized through the OVPR website.

   Metric: Funds allocated through competitive process
   Timeline: FY2017 if funds available

Task 2.D: The OVPR will invite the FAMIS Data Manager to make a presentation to ADRs and Center Directors each year to communicate the importance of keeping the FAMIS database updated with accurate information and the use of FAMIS data in determining State funding and the federally negotiated F&A (indirect) rate. In addition, the OVPR will invite representatives from PPD & PDC to make a presentation to ADRs and Center Directors regarding how to access architectural and engineering services in order to i) perform feasibility studies to convert existing non-research space to future research space; and ii) assess a PI’s current space and provide cost estimates for modifications to accommodate new research equipment.

   Metric: FAMIS data is deemed reliable by FSM and other users
   Timeline: Spring FY2017 and ongoing

Task 2.E: The OVPR will engage with PPD and the PDC to provide input into the facilities master plan to identify future research facility needs and funding sources. The Master Plan will i) identify current research space throughout campus that is outdated and cannot adequately support UNM’s current research needs; ii) include cost estimates and a funding model to modernize existing research space to meet UNM’s current research needs and iii) include basic lab construction/facility standards for all new and modified research spaces that meet our current requirements and that allow the spaces to be easily modified in the future to meet the ever changing research requirements.

   Metric: Research facility needs included in Capital Request to Legislature (based on master plan)
   Timeline: Planning initiated FY19

Objective 3: Improve OVPR Visibility And Effectiveness In Supporting Research

Task 3.A: OVPR will develop a mission statement and incorporate a stronger customer service based approach. As part of this effort, the OVPR will conduct annual self-assessments of the quality and utility of existing support services and use data from the annual RSP survey to make appropriate adjustments.

   Metric: Mission statement in Research Strategic Plan; perceptions of faculty assessed in annual RSP survey
   Timeline: Spring FY 2017
Task 3.B: VPR and/or AVPR (with the appropriate ADR) will regularly attend department faculty meetings to hear and address research concerns expressed by faculty and communicate OVPR mission and services.

  Metric: Number of meetings attended each semester; improved view of OVPR on annual RSP survey
  Timeline: Spring FY 2017 and ongoing

Task 3.C: The OVPR will serve as an advocate for the research community and will continue, on a case-by-case basis, to assist and facilitate interactions with university core offices such as Purchasing, Human Resources, Safety and Risk Services, and Facilities to ensure that important research needs are met in a timely and satisfactory manner. If persistent, systemic problems are identified, OVPR will work with the appropriate member(s) of senior leadership to establish a mechanism for addressing the problems identified.

  Metric: Faculty responses on the annual RSP survey indicate improved efficiency and shorter timelines for processing transactions with core offices and acknowledge value of OVPR as an advocate with these offices.
  Timeline: Spring FY2017 and ongoing.

Objective 4: Improve Research IT Capacity And Services

Task 4.A: OVPR will provide input into Central IT restructuring process to ensure research computing needs are addressed in funding and planning. Research computing needs will be integrated into performance review criteria for relevant IT leadership and into IT program effectiveness measures.

  Metric: Faculty satisfaction with Central IT support of research increases in annual RSP survey.
  Timeline: Spring FY17 and ongoing

Task 4.B: As a Center that reports directly to OVPR, CARC will develop a strategic plan to better meet the needs of their users for computing capacity and expansion of reliable user support. In the strategic plan, they will develop a strategy for ongoing support for the maintenance and refresh of core computing and data storage infrastructure within CARC that does not rely solely on OVPR resources.

  Metric: Number of CARC users increases
  Timeline: Spring FY17 and ongoing
FURTHER RECOMMENDATIONS

An annual RSP survey is listed as a means for assessing progress toward the objectives above (a metric). This survey should be developed to align with the structure and content of the Infrastructure Survey administered by this working group to allow for longitudinal assessment of progress. The results of the survey as well as any other instruments used to chart progress on the objectives of the Research Strategic Plan should be shared publicly through the OVPR website.

Several of the units included in the Infrastructure Survey do not report directly to the OVPR. However, the results of the survey should be shared with the leadership of these units so they can use the feedback to acknowledge success and improve their practices. OVPR needs to develop close coordination with other administrative offices that affect research success even though OVPR does not have managerial responsibility over them and ensure these other units are fully aware of the impact of their processes on the research enterprise.
### Appendix 1. Abbreviations used in this report.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Entity Name</th>
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<tbody>
<tr>
<td>BBER</td>
<td>Bureau of Business &amp; Economic Research</td>
</tr>
<tr>
<td>CARC</td>
<td>Center for Advanced Research Computing</td>
</tr>
<tr>
<td>CARF</td>
<td>Castetter Animal Research Facility</td>
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<tr>
<td>CASAA</td>
<td>Center on Alcoholism, Substance Abuse, and Addictions</td>
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<tr>
<td>CBF</td>
<td>Cell Biology Facility of the Biology Facility</td>
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<tr>
<td>CBME</td>
<td>Center for Biomedical Engineering</td>
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<tr>
<td>CEET</td>
<td>Center for Emerging Energy Technologies</td>
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<tr>
<td>CEPR</td>
<td>Center for Policy Evaluation and Research</td>
</tr>
<tr>
<td>CETI</td>
<td>Center for Evolutionary and Theoretical Immunology</td>
</tr>
<tr>
<td>CGA</td>
<td>Contract and Grant Accounting</td>
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<tr>
<td>CHEM.-FACILITIES</td>
<td>Department of Chemistry analytical facilities</td>
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<tr>
<td>CHTM</td>
<td>Center for High Technology Materials</td>
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<tr>
<td>CMEM</td>
<td>Center for MicroEngineered Materials</td>
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<tr>
<td>COI</td>
<td>Conflict of Interest</td>
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<tr>
<td>COMP</td>
<td>Office of Research Compliance</td>
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<tr>
<td>CRS</td>
<td>Center for Regional Studies</td>
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<td>CSI</td>
<td>Center for Stable Isotopes</td>
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<tr>
<td>CSWR</td>
<td>Center for Southwest Research and Special Collections</td>
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<tr>
<td>CWE</td>
<td>Center for Water and the Environment</td>
</tr>
<tr>
<td>DATAONE</td>
<td>Data Observation Network for Earth</td>
</tr>
<tr>
<td>ECISD</td>
<td>Export Control &amp; Industrial Security</td>
</tr>
<tr>
<td>EDAC</td>
<td>Earth Data Analysis Center</td>
</tr>
<tr>
<td>FRDO</td>
<td>Faculty Research Support and Development Office</td>
</tr>
<tr>
<td>FRI</td>
<td>Feminist Research Institute</td>
</tr>
<tr>
<td>GPS</td>
<td>Geospatial &amp; Population Studies</td>
</tr>
<tr>
<td>HESS</td>
<td>Health, Exercise &amp; Sports Sciences Dept. Johnson Center Facilities</td>
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<tr>
<td>HR</td>
<td>Human Resources</td>
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<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>IACUC</td>
<td>Office of Institutional Animal Care and Use Committee</td>
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<tr>
<td>IMS</td>
<td>Institute of Medieval Studies</td>
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<tr>
<td>IOM</td>
<td>Institute for Meteoritics</td>
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<tr>
<td>ISR</td>
<td>Institute for Social Research</td>
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<tr>
<td>IT</td>
<td>Information Technology</td>
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<tr>
<td>LAII</td>
<td>Latin American &amp; Iberian Institute</td>
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<tr>
<td>LARF</td>
<td>Logan Hall Animal Research Facility</td>
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<tr>
<td>MBF</td>
<td>Molecular Biology Facility of the Biology Department</td>
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<td>MMC</td>
<td>Maxwell Museum Collection</td>
</tr>
<tr>
<td>MSB</td>
<td>Museum of Southwestern Biology</td>
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<tr>
<td>OGCR</td>
<td>Office of Government and Community Relations</td>
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<tr>
<td>OIRB</td>
<td>Office of Institutional Review Board</td>
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<td>OSP</td>
<td>Office of Sponsored Projects</td>
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<tr>
<td>OVPR</td>
<td>Office of the Vice President for Research</td>
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<tr>
<td>PAIS</td>
<td>Building Plans for Physics, Astronomy, and Interdisciplinary Science Bldg.</td>
</tr>
<tr>
<td>PDC</td>
<td>Planning, Design, &amp; Construction</td>
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<tr>
<td>PPD</td>
<td>Physical Plant Department</td>
</tr>
<tr>
<td>PUR</td>
<td>Purchasing Department</td>
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<tr>
<td>RCR</td>
<td>Responsible Conduct of Research Training Program</td>
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<tr>
<td>RWJF</td>
<td>RWJF Center for Health Policy</td>
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<tr>
<td>SFS</td>
<td>Sevilleta Field Station</td>
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<tr>
<td>SHRI</td>
<td>Southwest Hispanic Research Institute</td>
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<td>SRS</td>
<td>Safety and Risk Services</td>
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<tr>
<td>STATS</td>
<td>Statistics Consulting Clinic</td>
</tr>
<tr>
<td>STC.UNM</td>
<td>formerly the Science and Technology Corporation @ UNM</td>
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<tr>
<td>UCAM</td>
<td>University Communication and Marketing</td>
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Appendix 2. Survey

The faculty survey, conducted through the Opinio esurvey system, November 16 – December 2, 2016.

Survey form and results available for download from: http://research.unm.edu/strategic-plan
Appendix 3. References cited in this report.


Appendix 4. General questions to guide interviews with key personnel at research infrastructure units.

1. Can you describe the population of researchers that are served by this unit?
2. How does this unit contribute to success of researchers at UNM?
   a. How do you measure your impact on research success?
   b. What policies and best practices does this unit employ that work well and contribute to its success?
   c. Can you think of any examples of successful efforts or positive impacts of this unit that you would like to highlight?
3. In what ways could this unit perform better?
   a. What would you change or do differently if there were no constraints?
   b. What are the major constraints or barriers to the effectiveness that are faced by this unit?
   c. Can you think of any examples that illustrate barriers to success or potential problems?
4. How do you feel about the level of staffing and quality of staff support in this unit?
   a. What training, retention, and recruitment efforts does this unit have in place?
   b. What specialized skills are required for staff in this unit?
   c. Are you able to recruit people with these skills?
   d. Do you pursue a customer service approach in interactions with researchers?
      i. If so, how?
      ii. If not, why not?
5. Are researchers' expectations from this unit reasonable given its access to support and resources?
6. How do you feel about the relationship of this unit with higher administrative units at UNM?
7. Would you recommend any change in the administrative structure within or above this unit?
8. Do you have any feeling for how this unit compares to analogous units at peer institutions?
Appendix 5. Interview Summaries

1. Summary of Interview with Stacy Kaneshige, Space Management; Interview conducted by Joel Straquadine and Mary Jo Daniel; 12/08/2016
   - Space is an institutional asset that is increasingly expensive to maintain and build. Space Management collaborates with numerous departments and initiatives to support maximizing UNM’s space and is committed to the effective and efficient use of that space. Space Management provides resources and data for various UNM reporting needs. They support the Indirect Cost Proposal (F&A), Building Renewal and Replacement (BR&R), Accreditations, etc., using industry standards and best practices. The primary tool used for tracking use of campus space is the FAMIS database (Facilities Asset Management Information System). Every unit has at least one individual with responsibility for providing accurate data via the space survey. Those data affect funding from the state level as well as determining federally negotiated F&A (indirect rate), which also impacts funding to the university and distribution of university resources, such as maintenance. When space is remodeled into a different type of space, this should be reflected in FAMIS but the Space Management unit is often not informed of changes. Users of FAMIS are frequently not fully trained and may not be aware of the implications of data being incorrectly entered.
   - Staffing of the unit is low; others using the same system have up to 6 times as many employees. The university does not have a policy requiring units complete and maintain accurate space surveys, leading to incomplete data that could negatively impact funding. All buildings on campus are now in the FAMIS system and there is an opportunity to link systems to provide more efficient, effective management of physical resources.

2. Summary of Interview with David Penasa, Engineering and Energy Services and Space Planning; Interview conducted by Joel Straquadine and Mary Jo Daniel; 12/09/16
   - Engineering and Energy Services works with researchers across campus to provide the physical facilities they need to conduct their work. They respond to requests for new facilities and upgrades of existing facilities; they do not identify needs in advance. They can provide preliminary designs and recommendations on new construction and upgrades and provide technical feedback to UNM as well as review designs from contractors to ensure university construction standards are met.
   - The complex construction and renovation tasks in which they engage entail numerous variables so meeting tight timelines is not seen as important as getting a job done correctly. When this unit is successful, UNM researchers have laboratory facilities that meet their needs and, as a result, UNM is able
to recruit and retain successful researchers. Staffing levels are seen as adequate at this time, however, many are at or near retirement age and there are concerns that identifying well-qualified staff in the future will pose a challenge.

- This unit can provide recommendations about more efficient and effective use of space, especially if consulted early. In all construction or renovation projects, there is a trade-off between short-term cost savings and building for flexible use of the space in the future.

3. Interview with Mark Emmons, Associate Dean, University Libraries; For the Research Infrastructure Working Group; Interview 11/30/16 by Mary Jo Daniel and Linda Petree

- University Libraries (UL) supports faculty and students from all disciplines in conducting both primary and secondary research. Research Data Services, a part of UL provides specialized assistance in managing and archiving data. UL collections include journals, books, and other resources that are needed for sponsored research, unfunded scholarship, dissertations and theses. Based on surveys conducted every 3 years, UL finds faculty and students value the collections and are always asking for more. UL recently launched a collaborative research space in Centennial Library and has created communal study spaces for students.

- UL works hard to manage its limited financial resources well, including purchasing multi-year packages of journal collections and participating in consortia to increase buying power. UL has subject area librarians who build connections with faculty in specific departments to provide assistance in teaching and research and there is a fundamental focus on customer service. They have been rated nationally as 60th out of approximately 120 university libraries in their category.

- The largest challenges faced by UL are related to financial constraints. Costs for collections continue to increase; users of print books (e.g., humanities) are likely to be impacted first, but if major journal collections are cancelled, this will impact STEM research areas. Staff and faculty positions have also been lost, leading to personnel being “stretched thin” and could lead to reduced operating hours for the libraries. When UL is able to hire, they find qualified staff locally and recruit nationally for faculty positions. Generally, salaries are competitive, training is adequate, and UNM is seen as a desirable work location so retention has not been a problem. The slow process of approving faculty contracts has resulted in the loss of good candidates for faculty positions.
4. Interview with Rosa Gonzalez Director of Sponsored Projects (Preaward and CGA) and Julian Sandoval Chief Financial Services Officer (payroll, OSP, finance systems management group); 15 December 2016; Interview conducted by Katie Witkiewitz & Stephen Cabaniss

• Summary: The Office of Sponsored Projects (OSP), including preaward and Contracts and Grants Accounting (CGA), performs a critical function for all UNM main campus researchers, including faculty, staff, and students on main campus, as well as the branches. Results from the Infrastructure faculty survey identified several problems with OSP and CGA, with several faculty expressing frustration with the functioning of these offices. During our interview with Rosa and Julian there was some recognition of the issues and a desire to improve the customer service orientation of OSP. Tremendous turnover in OSP has led to difficulties in training staff and providing good service to the campus community. Retention is also difficult given low pay at UNM and the high stress deadline driven environment. It was also somewhat clear that OSP is unaware of many of the difficulties in conducting sponsored research at UNM given the clear disconnect between the faculty survey comments and the acknowledgment of problems by the leaders of OSP.

5. Center for Advanced Research Computing (CARC) Interview Summary; Interview Date: 12/6/2016; Interviewer: Karl Benedict; Interview With: Patrick Bridges, Interim Director of CARC and Associate Professor of Computer Science

• The Center for Advanced Research Computing supports researchers across main and north campus in a wide variety of disciplines, primarily in STEM fields, but with a small but growing number of social sciences, arts and humanities researchers. These research users range from individuals to research teams, and consist of approximately ±10 consistently heavy users every week with dozens of additional users running smaller jobs on CARC systems. Their overall user based is about 50-100 regular users. In support of these researchers CARC provides a variety of research computation services including CPU-intensive, large memory, GPU, and capacity computing ("embarrassingly parallel"). These computational services are complemented by providing large-scale storage support. In support of these services CARC’s strengths in research support include providing researchers with application development support in developing and implementing solutions within CARC’s systems to "get researchers to results". This approach is based upon a model of starting work "where the researchers are" and working with them to transition their workflows into CARC’s environment for execution at scale. Another strength (and weakness - see below) is that these services are provided without required costs to researchers, significantly lowering the barrier to entry for using CARC systems for research. Areas for improvement
in CARC's research services include expanding the number and diversity of users in the system while developing a funding model that provides sustainable services in the face of increasing demands for those services. In conjunction with increasing system demands as CARC's user base grows is an ongoing requirement for hardware and software maintenance and replacement – a capital cost for which the current direct funding model from the OVPR is not sufficient. One potential solution that was discussed in response to this funding challenge is adopting a "freemium" model in which a base level of services is provided without cost to researchers, but higher tiers of service are provided for a fee to help cover the ongoing costs of maintaining and replacing CARC's systems.

- Another area for improvement, also associated with increasing demands for CARC services is expansion of application development support capacity through hiring of two more application developers. While this is a needed area of growth for CARC, two factors limit CARC's ability to expand their staffing to meet support demands: funding for positions and competition (particularly in terms of salary) from the National Laboratories and NM Consortium for the limited number of individuals with the combined computational and disciplinary expertise required to support researchers in effectively transitioning their researchers into CARC's environment. CARC uses a number of strategies for capturing feedback on the services it provides in support of research. These include a recently created internal advisory board of users and others from around the UNM campus; a help ticket system into which support, use and usability questions are submitted and tracked; an executive committee that includes UNM Associate Deans for Research; and informal feedback provided by PIs. While not yet implemented CARC has begun internal discussions on the creation of a user survey that they hope to release next year. The feedback captured through these methods is used both in the near term (especially from the help tickets) and for strategic planning and implementation. Given its support role for individual researchers and research teams, key measures of success include publications and submitted/awarded grants by researchers supported by CARC. Additionally, CARC's support for graduate student research is measurable through the number of degrees awarded to students who used CARC capabilities as part of their research program.

6. Interview with Thomas Turner, Associate Dean for Research, College of Arts & Sciences; Interview 12/06/2016 by Christopher Witt and Jennifer Kavka

- The College of Arts & Sciences (A&S) is the largest and most diverse research unit on campus consisting of about 450 faculty – 70% of which are considered highly research active. A&S' primary research mission is to support, develop, and advocate research and scholarship within it's
community. Researchers interest’s in A&S range from the humanities to natural sciences and contain complex differing research needs. There is a deep tradition and culture of collaboration in integrated research, scholarship, and education among A&S faculty and A&S researchers have established partnerships with every College, School, or Center on campus.

- A&S supports its research mission using funds from returned overhead generated from grants and contracts awarded to faculty in the College. The amount returned quarterly comes from the Vice President for Research’s (VPR) office and varies based on the amount withheld from the VPR to cover their operational costs (top slice model). From these funds, A&S provides seed funding for their faculty (including subvention funding, research funds, and funds for an undergraduate research initiative), salary support for Faculty Research Support Officers who assist their constituents with proposal preparation and submission, start up packages for new faculty, retention packages for current faculty, as well as support for core research facilities on campus (including staff salaries and equipment).

- The current challenge faced by the College is the reduced amount of resources being returned to the college from the VPR due to the implementation of the top slice model. This has negatively affected the College’s ability to provide adequate start-up packages and retention packages as well as inhibited its ability to provide adequate amounts of staff support to assist with post award management. Because of the top slice structure, Category III centers have become rivals for dollars rather than entities for collaboration. Presently, the college is expected to provide start up funds for category III center faculty yet receive no return on their investment as overhead generated from category III center faculty does not come back to the College. If category III centers contributed to start-up packages or gave portions of overhead return to the A&S, more productive collaboration could be achieved and inequities could be addressed.

7. The working group's general questions were answered in writing by the Division of Human Resources on 12 December, 2016, as follows: Goal: “Make recommendations on where changes can be made to propose new ways in which we can improve our infrastructure."

- Can you describe the population of researchers that are served by your unit?
  - GENERAL ANSWER: The Division of Human Resources (HR) does not employ any Research Staff or Research Faculty directly within the division. However, several of HR’s units serve all employees (faculty, staff, and students) of the University with regard to central HR administrative functions. These services would include research personnel.
Benefits: The Benefits office supports all benefits-eligible faculty, staff, and student employees with regard to administration of benefit plans.

Employee Health Promotion: EHP serves the entire benefits-eligible UNM population with regard to health initiatives.

Client Services: Indirectly supports approximately 250 employees in various research titles. Centrally manages the departmental postings, hires and other employment functions/paperwork for the research hires. Client Services, in coordination with Labor/Employee Relations, offers consultation on employee/supervisor matters.

Compensation: Manages compensation systems, job descriptions, and salary scales for all staff employees.

Employee Organizational Development: Offers standard training and customized facilitations as requested for faculty and staff.

HR Information Technology: Generates and makes available staff reports.

HR Service Center: Serves as the central point of contact for all employees (faculty, staff, and students) and prospective employees.

Labor/Employee Relations: In coordination with Client Services, offers consultation on employee/supervisor matters. Conducts investigations and interprets university policy and collective bargaining agreements with regard to hire type.

UNMTemps & Recruitment Services: Centrally manages the departmental postings, hires and other employment functions/paperwork for any temporary or targeted research hires.

- How does this unit contribute to success of researchers at UNM?
  - GENERAL ANSWER: HR provides the central administrative services to employ staff researchers (faculty employment areas handle this for faculty researchers.)

- In what ways could this unit perform better?
  - GENERAL ANSWER: It seems that the university could perform better if we didn’t have so many different areas to communicate and coordinate with when a process, policy or system needs to be changed. The university is large and there are many areas doing the same functions but for different employee types. For instance, UNM is implementing a new hiring and onboarding module that must accommodate for five different employment area types. Additionally, the university does not use the same timekeeping system across the board; some employees are on Lobotime and others use Banner Time.
Entry. There is no clear and consistent structure in some areas and this makes things more difficult when change must be implemented.

- **How do you feel about the level of staffing and quality of staff support?**
  
  o **GENERAL ANSWER:** For HR, we feel like we are adequately staffed. We have lost a few positions through attrition, in an attempt to reduce overall costs. We are continuously developing our staff through training and we look for processes that we can improve that help our staff perform their duties better and timelier.

- **Are expectations of this unit reasonable given its access to support and resources?**
  
  o **GENERAL ANSWER:** HR strives to be the example and meet reasonably high expectations.

- **How do you feel about the relationship of this unit with higher administrative units at UNM? Would you recommend any change in the administrative structure within or above this unit?**
  
  o **GENERAL ANSWER:** The VP of HR reports to EVP David Harris so the VP of HR is actively involved in discussions with University Leadership. HR has a good relationship with all areas of campus and is the main contact for organizational issues, questions on policies, benefits, and employee and management matters.

- **Do you have any feeling for how this unit compares to analogous units at peer institutions?**
  
  o **GENERAL ANSWER:** HR is a key central administrative unit and typically reports to the highest level staff administrator under the President, which is where we currently reside.
Appendix 6. Acknowledgements.

The Research Infrastructure Working Group (RIWG) wishes to thank all of the 273 faculty members who took the time to fill out the Survey on Research Infrastructure. Grace Faustino provided expert technical assistance to implement and distribute the survey. Michaela Paulette Shirley produced word clouds to help interpret the text answers regarding strengths, weaknesses, and opportunities. Ricardo Maestas provided expert logistical help to keep the RIWG on task. Finally, the RIWG thanks all of the units that were subject to evaluation in this report and their personnel, particularly the administrators who agreed to be interviewed for the sake of assessment.
Working Group Report V: Federal & State Governmental Relations

Dr. Karl Benedict & Dr. Ivan Deutsch Discussing Items From The Federal And State Governmental Relations Working Group:
Members: Karl Benedict (Chair), Ivan Deutsch (Co-Chair), Gabriel Sanchez, Anne Jakle, Melissa Binder, Shirley Baros, Meriah E. Heredia-Griego.
GOALS

The goal of the Working Group on Federal and State Governmental Relations (FSGR) is to examine UNM's current practices as they relate to 1) the development and execution of the institutional legislative priorities and initiatives; 2) activities and alliances with federal laboratories (including national laboratories and other federally funded labs); and 3) building and maintaining linkages with funding agencies at the regional, state and federal levels. From the results of this background work, the working group is to develop recommendations for ways in which UNM can 1) improve its performance in the areas of developing and achieving its legislative priorities, 2) more effectively build and maintain productive relationships with federal laboratories, and 3) enhance the competitiveness of UNM's researchers through expanding and improving relations with sponsoring agencies.

METHODS

To accomplish the goals discussed above, the working group sought to collect data/information from a variety of sources detailed below.

*Interviews.*
A key method to collect relevant data was to interview individuals from within and outside of UNM who were identified to provide insights relating to UNMs practices, effectiveness, and potential strategies related to the three broad topic areas defined in the working group’s charge (legislative priorities, federal laboratories, sponsoring agencies).

The identified individuals were assigned to groups that would allow for efficient outreach and information capture. The identified groups consisted of:

- Individuals involved in the *process* of developing and communicating UNM's legislative priorities.
- Individuals affiliated with UNM programs or projects that are funded by governmental sponsors through *contracts*.
- Individuals affiliated with UNM programs or projects that are funded through grants or other types of *sponsor* agreements.
- Individuals that are involved with the development or maintenance of linkages with *federal laboratories*.
- **Other individuals** that can provide insights from the perspective of the government agencies and legislators relating to the process of developing and communicating institutional legislative priorities and proposals.
Interview protocol templates were developed and used for consistency of questions and information being solicited (See Appendices A, B and C)

**Review Of Written Materials:**

Relevant sources of materials and data were identified, reviewed, and included:

- Written materials from UNM and peer institutions relating to institutional legislative priorities and their development
- Sources of data relevant to trends in linkages and relations with federal laboratories and sponsor agencies

Following the conduct and summarization of notes from the interviews, review of available written materials and data, the FSGR synthesized the material into a set of findings and action plan.

**FINDINGS**

(Organized by broad topic areas)

**Legislative Priorities Development and Implementation**

- A review of the postings from 2012-2016 to the GOVREL (Government Relations) mailing list indicated that there were no open forums announced through that list in which the development of the legislative priorities were discussed. While the interview with the Office of Government and Community Relations (OGCR) staff provided an overview of the legislative priority development process that is based upon the Provost developing a set of proposed legislative priorities through input from the Deans (with the Deans presumably seeking input from the programs within their respective Colleges/Schools), the list of proposed priorities is provided to the President/EVPs/Chancellor, who narrow down the list, which in turn is proposed to the Board of Regents for their final approval. While this process has implicit input at the College level, interviews with contract and grant sponsored researchers suggested that the actual process for identifying candidate priorities at the College level is not clear, and seems to be more based on individual actions as opposed to seeking broad input. This is inconsistent with the description in *Administrative Policy 2050*, Section 3 of the process for developing legislative priorities which is described as: "an inclusive and transparent process which provides students, faculty, and staff an opportunity to participate in the development of the University's priorities. This year-round process includes **open forums**, committee meetings, and legislative hearings during the months leading up to the legislative session." (emphasis added)
• While state-level legislative priorities have historically focused on a limited number of Research and Public Services Projects (RPSPs) in combination with other university-related issues (e.g. funding formulas, I&G, lottery scholarships), Federal legislative priorities have had a specific focus on research priorities developed in consultation with the OVPR.
• The OGCR coordinates with the OVPR and Deans to develop opportunities for researchers and UNM leadership to meet with agency officials and program managers to help build support for UNM programs that would benefit from improved linkages with those agencies and programs.
• The different funding models at the state and federal levels necessitate different strategies as, with the exception of contracts with individual state agencies, New Mexico does not have an established pool of funds in support of competitively bid research projects. This is in contrast to the multiple federal funding agencies that, while their levels of funding vary from year to year, have established budgets and processes for reviewing and awarding competing proposals for research funding. These different models have an impact on where the OGCR focuses its efforts - primarily at the legislative level in the state, and with a greater emphasis in sponsor agency interactions at the federal level. In both cases, demonstrating the impact and importance of UNM's research was identified as a key area of work for their office.
• Funding of and the development of a more transparent policy and process for required cost share was highlighted in the researcher interviews. Related to that stated need, it was determined that there is a need to establish a pool of money for cost share. In support of this objective, we suggest that the OVPR, in conjunction with the OGCR, develop a plan to submit a request for legislative appropriation for cost share.

Improve and Grow the Relationships with the National Laboratories
New Mexico benefits from a rich environment of federal and national laboratories including the Air Force Research Laboratory (AFRL), Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL). The proximity of the labs to UNM, the flagship research university in New Mexico, thus provides unique opportunities for partnerships that mutually benefit the research missions of the respective institutions.

Existing agreements and partnerships between the labs and UNM.
The University of New Mexico enjoys very good relationships with the federal laboratories in the area. For example, UNM has a Strategic Educational Partnership Agreement in place with the Air Force Research Laboratory since 2011 and the Air Force Office of Scientific Research (AFOSR) has funded basic UNM research at approximately $12M over a three-year period (2012–2014).
Moreover, Los Alamos National Laboratory has had a long history of partnership with UNM with formal agreements under a current MOU, and discussions are ongoing with the Provost’s office for a new more specific Institutional Agreement. UNM is LANL’s largest research contract customer and staffs LANL’s scientific and administrative functions more than any other university.

Sandia National Laboratories has recognized UNM as of one of its five Academic Alliance schools (together with Purdue, Georgia Tech, University of Illinois Urbana-Champaign, and the University of Texas Austin). The current MOU and other formal agreements renew the SNL/UNM partnership. UNM and SNL jointly occupy the Advanced Materials Laboratory (AML), which serves as a gateway facility for SNL on UNM’s South Campus. There are currently three UNM professors with true joint appointments as SNL scientific staff. UNM is the largest university recipient of SNL Laboratory Directed Research and Development (LDRD) funds through contracts on collaborative research.

Areas of current joint research and opportunities for growth.
A key area of collaborative research with the Air Force Research Laboratory is Directed Energy (lasers, optics, high-power electromagnetics), as represented, for example, by the Applied Electromagnetic Group that receives a $1M/year grant to study high power electromagnetics. There are opportunities to expand this collaboration, particularly in the areas of ultra-short lasers and optics with CHTM and the Optical Science and Engineering program. Another key area of joint activities is Space Systems, including building and launching space vehicles and the associated science. An additional area for growth includes Big Data Analytics, leveraging the Maui High Performance Computing Center.

There are a number of areas of research collaboration between LANL and UNM. Energy technologies and science provides the basis for much collaboration, particularly through materials science. An example is the historic Los Alamos Meson Physics Facility (LAMPF), now called the Los Alamos Neutron Science Center (LANSCE). Health science is an active area of collaboration, including cancer research and genomics. There is also a strong tradition of collaboration in geosciences. Other areas include nuclear engineering, radiochemistry, and nuclear/particle physics, particularly studies of neutrinos and the mysteries of “dark energy.” High performance computing has been a cross-cutting area of collaborative research. Additional collaborative projects are being facilitated by the New Mexico Consortium, including a new proposal for a Bioenergy Research Center and an Ultra-scale Systems Center.
Sandia National Laboratories has a long history of joint research with UNM in the areas of energy/materials, microfabrication, and nanoscience, particularly via CHTM, the AML, and related centers. This continues to be an area of strength, particularly in the area of photonics and the development of next-generation nanoscale devices. The current MOU calls for increased joint research in other areas including high-performance-computing/cyber-security/quantum-information-science, high energy density science, water, bioscience, and nuclear engineering. Some of these areas already involve joint activities, e.g., quantum information science via the Center for Quantum Information and Control (CQuIC) in which SNL staff have adjunct and research professor letters of academic appointment. New joint hires, mentioned above, are expected to create strong bonds in these areas.

Additionally, graduate education and research go hand-in-hand, particularly in apprentice-style training that is an integral part of MS theses and Ph.D. dissertations. Participation of students in the research endeavor is a key component of building a research partnership between UNM and federal laboratories. There are currently many opportunities for students at the labs, particularly through summer internship programs. Dissertation research is typically funded directly by a given project through a contract to UNM.

Finally, there are a number of outstanding issues that are barriers to student participation in laboratory-based dissertation research including the mismatch in the funding cycle for DOE/LDRD projects vs. the duration of a PhD project, salary levels, and ITAR/export control.

Role of joint hires, adjunct and other mechanisms for shared personnel. There are currently three UNM faculty members who have true joint positions with SNL (shared salary, benefits, etc.). Joint hires should be senior people, able to navigate these issues and bring strategic partnership between UNM and the National Laboratories. A key component of a truly effective joint hire program will be for UNM to clearly articulate a crafted and well-communicated process for effectively and efficiently supporting joint hires with the national laboratories. The Office of the Vice President for Research will work with the Provost Office and Faculty Contracts Office Staff to develop a joint hire policy. The policy should be communicated to deans, department chairs and center directors.

Another mechanism for shared personnel is the letter of academic title: adjunct professor, research professor, and National Laboratory Professor (NLP). The relative rights and privileges of these titles need further clarification and should be uniform across interactions with each partner national laboratory. The NLP is meant to be a
special high-value title associated with particular rights and responsibilities, would be limited to a few senior staff members, and approved at each federal laboratory. The role of an NLP is to establish, strengthen, and grow strategic research collaborations between the labs and UNM. An NLP should have passion for the mission of the university, particularly working with students.

Linkages with Funding Agencies
Impact of UNM relationships with funding agencies.
The impact of UNM's relationships with funding agencies seems to be primarily focused at the level that individual researchers are able to make with sponsors through increased familiarity and interactions with those sponsors, both in terms of linkages with program managers within federal sponsor agencies, and programs within state agencies with whom UNM's research centers interact. Overall, currently institutional relationships do not seem to play as strong a role in the competitiveness of research proposals in comparison with the experience and familiarity that UNM researchers have with and by the sponsoring agencies.

When considering the specific researcher-sponsor linkages that provide the greatest benefit, several productive activities emerged: participation in review panels (proposal, site visit, reverse site visit, etc.), service on external advisory committees, serving as "rotators" within NSF and other agencies, and meeting and getting to know program managers within the sponsor agencies (at either the state or federal level). One potential barrier to UNM researchers being able to take advantage of opportunities for gaining deep sponsor agency connections is the potential\(^{59}\) for sponsor agencies to enforce a requirement for institutional cost share for Interagency Personal Agreement (IPA) positions. In anticipation of this becoming a potential issue, we recommend that UNM identify a funding pool to cover the expected institutional contribution (10% in the case of NSF\(^{60}\)) for IPA positions.

An additional dimension emerged when considering relationships with state government agencies - that of UNM being more effective at promoting and streamlining the delivery of UNM services and capabilities to the state. In many respects this relates to UNM demonstrating the benefits that some UNM research (and applied research) programs can provide to the state in contributing to economic, human capital, and quality of life development, and lowering the administrative barriers to establishing productive partnerships with state agencies. In particular, the contractual nature of many agreements with state agencies was noted in the interviews with research center

\(^ {59}\) discussions with OVPR personnel indicate that the NSF "requirement" for institutional cost share for IPR salary has not been a barrier to recent NSF rotators from UNM.

\(^ {60}\) https://www.nsf.gov/careers/rotator/ipa.jsp
personnel as a significant barrier to efficient execution of funding agreements, often creating significant delays in being able to initiate and successfully complete fixed-period awards. This challenge within UNM’s award process is compounded by the complexities of negotiating state contracts with agencies. The development of master agreements with state agencies within which specific awards can be executed was identified as a potential solution to this significant problem. Additionally, providing an increased award amount for which PIs would have signature authority was seen as an additional strategy to lower the administrative barriers to timely initiation of projects with state agencies.

While lowering administrative barriers to efficient development and delivery of valuable research products to state agencies is critical, it was also noted in the interviews with the Center Directors that institutional barriers exist that reduce the potential impact of the applied research that is conducted in support of (primarily) state agencies. In particular, the absence of funding beyond that provided by the sponsoring agencies to support transitioning applied research products (which are the common focus of state agency contracts) into more traditional scholarly outputs (the more valuable products within the context of the university) was seen as a barrier to achieving broader impacts for applied research projects. Additionally, the current emphasis within the promotion and tenure process on traditional peer-reviewed publications as opposed to (potentially) high-impact community-engaged scholarship and applied research serves as an impediment to some UNM faculty contributing to projects that would produce both high-impact results for the state, but also increase the visibility and value of UNM's contributions to the state.

Strategies for increasing UNM competitiveness
At the federal level, the importance of researchers developing effective relationships with sponsor program managers and familiarity with programs was highlighted as a critical path to increased competitiveness. Institutional support and capacity building can contribute to the development of these capabilities through:

- Developing a robust mentoring and professional development program for incoming faculty (and post-doctoral researchers) that provides them with access to successful researchers and research strategies.
- Instituting funding and logistical support for facilitating faculty meetings with sponsoring agency program managers.

Role of UNM Legislative Priorities in impacting UNM's competiveness
From the perspective of the sponsored research interviewees, the impact of federal legislative prioritization is variable - appearing to vary by disciplinary area. Specifically, the inclusion of support for DOE programs that are aligned with UNM research foci has
proven beneficial in supporting those programs - ultimately contributing to the continued alignment between DOE programs and an area of UNM research strength. The development of a more visible process for identifying additional areas of focus for federal legislative prioritization could broaden this impact beyond the DOE programs that have received the greatest attention.

Strategies for strengthening linkages with state and federal policy makers and the federal laboratories
Linkages with policy makers were identified as being strengthened through reinforcement of alignment between policy and national lab priorities and research focus areas at UNM. The importance of UNM as a pipeline for developing the workforce in support of national lab activities was also highlighted in interviews with both sponsored project researchers and national lab interviews. Alignment of UNM's research strengths and policy and national lab priorities and workforce needs may be accomplished through continuing assessment of both. This is an activity that could be supported through work with UNM's government relations team to track evolving areas of policy focus such as those identified by the President's Council of Advisors on Science and Technology.

ACTION PLAN

The above findings suggest that UNM embark on the following five strategic objectives and their associated tactics to achieve the goals identified in the working group charge.

Objective 1: Improve The Process Of Developing UNM's Federal And Legislative Priorities As It Relates To The Research Focus Areas.

Task 1.A. The OVPR will coordinate with the Office of Government and Community Relations to organize forums to consult annually with ADRs, Center Directors and other stakeholders on recommendations that will be developed into UNM's legislative priorities.

Metrics: Encouraged open feedback and participation in recommendations for legislative priorities.
Timeline: Forums will be implemented in fall FY2018, prior to the annual legislative session. May occur on 2-year cycles.

Task 1.B. The OVPR will work with the Office of Government and Community Relations to seek legislative appropriation for cost share.

Metrics: Submission of legislation for cost share appropriation.
Timeline: Fall FY2019

Objective 2: Improve And Grow The Relationships With The National Laboratories

Task 2.A. The OVPR will work with the Associate Provost for National Laboratory Relations to monitor the National Laboratories for new research and collaborative opportunities.
   Metrics: Yearly progress report of potentially new research and collaborative opportunities.
   Timeline: Fall FY2019

Task 2.B. The OVPR will work with the Assoc. Provost for National Laboratory Relations to seek new opportunities for joint ventures between UNM and the national laboratory partners.
   Metrics: Submission of a proposed new joint venture between SNL and UNM
   Timeline: Fall FY2019

Task 2.C. The OVPR Staff will review mechanisms for graduate students to perform Ph.D. dissertation research at the labs using the AML and CQuIC as case studies.
   Metrics: Submission of a policy for graduate students to conduct dissertation research at the national laboratories.
   Timeline: Fall FY2018

Task 2.D. The OVPR will work with the Assoc. Provost for National Laboratory Relations and the Senior Vice President for Academic Affairs to review and disseminate the eligibility, roles, and responsibilities for laboratory faculty designations. (National Laboratory Professor, Adjunct Professor and Research Professor).
   Metrics: Review is complete and dissemination to department chairs has occurred.
   Timeline: Fall FY2018

Task 2.E. The OVPR will work with the Provost's Office (Faculty Affairs) to develop the jointly crafted and well-communicated processes for effectively and efficiently supporting joint hires with the national laboratories.
   Metrics: The jointly crafted process for joint hires has been disseminated to department chairs and center directors.
   Timeline: Fall FY2019
Objective 3: Strengthen Institutional Linkages And Enhance Relationships With Funding Agencies.

Task 3.A. The OVPR Staff will develop a strategy for systematically identifying and promoting opportunities for UNM researchers to serve in funding agency rotator positions.

   Metrics: Strategy has been developed and disseminated to UNM researchers.
   Timeline: Spring FY2019

Task 3.B. The OVPR will identify a funding pool to cover the expected institutional contribution (10% in the case of NSF) expected for IPA positions.

   Metrics: An initial fund of $XX will be created.

FURTHER RECOMMENDATIONS

In addition to the above specific objectives and tasks in the action plan, some further general recommendations should be considered in the long run for continuing to increase UNM’s research success through more effective connections with state and federal sponsors, agencies, and the federal laboratories. These include:

1. Aligning objectives in the Research strategic with long-term legislative initiatives that can realistically be expected to play out over multiple legislative sessions, and potentially executive terms.
2. Develop infrastructure that enables more efficient communication of positive impact UNM’s research has on the state.
3. Develop administrative models that recognize the diversity of research activities on campus (small-scale to large-scale, unfunded to large funding, short-term [quick turn-around] to long-term) and are nimble (a term coming out of the interview with the OGCR) in response to changing funding and research collaboration scenarios.
APPENDICES
Appendix A: Office of Government & Community Relations Staff Interview Protocol

Interviewer Name and Title: Meriah E. Heredia-Griego & Anne Jakle
Interviewee Name and Title: Staff in the Office of Government & Community Relations
[Note to Interviewer: Confirm interviewee’s name and title.]

Introductory Protocol
My name is <interviewer name>, and I/we am/are conducting this interview on behalf of the Government Relations Working Group of the UNM OVPR Research Strategic Planning Committee. To facilitate our note-taking we would like to record this conversation. Please sign the informed consent and release form. We respect your privacy; only members of the Government Relations Working Group will have access to this recording and your individual responses. Responses that could identify you will be held confidential. The recording will be destroyed after it has been transcribed and we have had the chance to contact you to clarify a response or to ask further questions. Your responses will be summarized and shared with the larger Strategic Planning Committee as part of the process of integrating the outcomes of all of our interviews into working group reports and the overall research strategic plan. We have planned this interview to last no longer than <e.g., one hour>. Thank you for agreeing to participate.

Introduction
The Office of the Vice President for Research at UNM is developing a research strategic plan to provide the strategic framework under which UNM’s main campus research enterprise will be managed for the next five years. For our purposes, research refers to systematic and original investigations to generate, develop, and validate new knowledge or solutions to contemporary problems. Research involves scholarship—the critical and accurate synthesis and dissemination of knowledge and of creative works in the arts, literature, or professions. The governmental relations working group is one of several teams focusing on different aspects of the strategic plan. In particular, our working group is specifically examining the relationships with local, state, and federal funding and other agencies; federal laboratories (including our two national labs); and state and federal legislative processes. As part of this examination we seek to characterize these relationships, the outcomes of these relationships, and identify areas for improvement. Your input is vital to this process.

Questions
1. How long have you been:
   a. In your present position?
   b. At UNM?
2. Briefly describe your role:
a. In teaching.
b. In research.

3. What is the process to create internal legislative priorities?
4. What role does OGCR play in this process?
5. What is the best way to inject support for research into this process? How can we improve the priority development process to include strategic research activities?
6. What types of research is state government interested in? Federal government?
7. Perceptions are that UNM research is not well-known to the community, legislators, and individuals in state government. What do you think are the best ways to talk about UNM research/sell it/raise awareness and support for it in the state? What strategies do you suggest to highlight UNM research nationally?
8. What do you look for when choosing to pursue direct appropriations for research (e.g., UNM Utton Center or programs like the Water Resources & Research Institute at NMSU)?
9. What are ways that you think the research community at UNM can strengthen ties with state and federal policy makers and the national laboratories?
10. What other comments would you like to make?
11. Do you have any questions for us?

Conclusion
Thank you for your valuable time. We appreciate your input. The research strategic plan, when developed, will become the road map for research over the next five years at The University of New Mexico. You can learn more about the planning process at http://research.unm.edu/research-strategic-plan.
Appendix B: Interview Summary related to Governmental and Community Relations

Interviewer Name and Title: Meriah E. Heredia-Griego & Anne Jakle
Interview Date: October 27, 2016
Interviewee Name and Title: Office of Government & Community Relations – Connie Beimer, Director; Matt Munoz, Gov Relations Manager

Introductory Protocol
My name is <interviewer name>, and I/we am/are conducting this interview on behalf of the Government Relations Working Group of the UNM OVPR Research Strategic Planning Committee. To facilitate our note-taking we would like to record this conversation. Please sign the informed consent and release form. We respect your privacy; only members of the Government Relations Working Group will have access to this recording and your individual responses. Responses that could identify you will be held confidential. The recording will be destroyed after it has been transcribed and we have had the chance to contact you to clarify a response or to ask further questions. Your responses will be summarized and shared with the larger Strategic Planning Committee as part of the process of integrating the outcomes of all of our interviews into working group reports and the overall research strategic plan. We have planned this interview to last no longer than <e.g., one hour>. Thank you for agreeing to participate.

Introduction
The Office of the Vice President for Research at UNM is developing a research strategic plan to provide the strategic framework under which UNM's main campus research enterprise will be managed for the next five years. For our purposes, research refers to systematic and original investigations to generate, develop, and validate new knowledge or solutions to contemporary problems. Research involves scholarship—the critical and accurate synthesis and dissemination of knowledge and of creative works in the arts, literature, or professions. The governmental relations working group is one of several teams focusing on different aspects of the strategic plan. In particular, our working group is specifically examining the relationships with local, state, and federal funding and other agencies; federal laboratories (including our two national labs); and state and federal legislative processes. As part of this examination we seek to characterize these relationships, the outcomes of these relationships, and identify areas for improvement. Your input is vital to this process.

Questions
• How long have you been at UNM?
• 12 Years; in present position ~2 years, including when interim Director of Government Relations

• Briefly describe your role:
  o Director of Government Relations -- oversee the government relations for university main campus, health sciences, and branch campuses. No teaching or research done directly: role is related to mission of supporting teaching and research from a government relations perspective.

• What is the process to create internal legislative priorities?
  o **State priorities:** This year (and for the foreseeable future), it’s different because there’s no money. In general, there is a process to identify new RPSPs (Research and Public Service Projects) – the Provost leads the effort and seeks out proposals and ideas from faculty through their Deans/direct reports. The Provost’s office culls the ideas and then works with the Government Relations Office to align ideas with legislative priorities. New RPSPs are identified through this process, and current/ongoing ones can ask for additional funding.
  o **Timeline:** The Provost sends out letter in May/June for RPSPs; HED wants them by August 1st
  o **Continuing RPSPs must be submitted by September 1**—this is required by administrative code.
  o **Chain of RPSP/legislative ask approvals:** Provost → President/EVPs/Chancellor → Board of Regents → HED → Legislature
  o **Beyond special funding asks,** the Government Relations Office works on overarching university priorities like funding formulas, I&G, lottery scholarship (big priority) – office helps university administration look at these issues and identify priority packages. Issues that are identified at the Budget Summit are important.
  o **Federal priorities:** Federal priorities are largely research related. Government Relations Office works with the VPR to identify priorities that he and the research community at UNM have. Gov Relations Office can assist setting up relationships with program managers and connect researchers with specific agencies. The Government Relations Office takes the VPR to DC to meet with specific agencies – this helps provide information about what funders are thinking and what future directions they may be taking. VPR goes with President to present federal relations package in DC to Congressional representatives.

• What role does OGCR play in this process?
  o Work closely with VPR and Provost and specific Deans to provide information/input/opportunities and meet with agencies and key people. Helps UNM become more competitive.
• What is the best way to inject support for research into this process [of creating legislative priorities]? How can we improve the priority development process to include strategic research activities? [Better question: How can the VPR office best engage in the process to elevate strategic research activities as university priorities?]
  o At a federal level: this is what we already do – priorities are all research related.
  o At the state level: The state budget situation has put a crimp in the plans – worked with VPR since he arrived to identify some research-focus projects at the state level. At the state level there are contracts that come out of state agencies (small contracts) – there is opportunity for UNM to be competitive and get more of those contracts.
  o Overall, it would be very helpful to identify an area or areas of research excellence that UNM is good at or would like to be known for and where we want to put our energies for research: “We want to be known as [this].” Then, we can create a federal relations plan (that targets specific agencies, and through that process increases grant opportunities) that ties into a state relations plan (e.g., a state ask includes an integrated agenda for a lab renovation in a specific research area that matches the university-level research priorities).
  o It is helpful if the UNM research community is flexible and nimble, so it can respond to the interests of state agencies and legislators. (E.g., recently, UNM was able to get additional funding for medical residencies, which helped meet the need of having more health professionals in the state.) Be nimble, but also have this strategic plan to strike where there is opportunity for priority hot topics.
  o The interim committee process is also another place where VPR can promote strategic research activities identified in the plan.
• What types of research is state government interested in? Federal government?
  o Federal government: Lately there have been opportunities with the Department of Energy and Clean Energy Technologies; directed energy.
  o Provost has said arts and humanities opportunities should be pursued.
  o College of Ed visited DC in May (5 researchers) went to program managers and matched interests to a competitive solicitation that was funded.
  o State government: Much of the policy-based research is done at DFA and LFC; the better question is not what they are interested in, but where can we fit ourselves in. The state is not like the federal government where there is money set aside for competitive process for a specific topic. Funding is problem-driven. In NM, economic development and rural economic development are always hot topics.
• Perceptions are that UNM research is not well-known to the community, legislators, and individuals in state government. What do you think are the best ways to talk about UNM research/sell it/raise awareness and support for it in the state? What strategies do you suggest to highlight UNM research nationally?
  o It would be helpful to have the VPR or other priority research areas present more at the interim legislative committees; having a focus in some key areas (i.e., the strategic plan) will help with messaging and direction for those who support the OVPR office. Arrange meetings with legislators for some of our projects.
  o Communications and marketing is important. Get injected into the news.
  o Highlighting UNM research nationally: there are opportunities to do that if there’s a priority of the research office. There are organizations that UNM is a part of that support information/knowledge of basic research, but there has to be engagement from UNM to take advantage of the opportunities. (E.g., the Science Coalition has a campaign right now on highlighting energy research). Takes effort to put together information to do this. APLU doing a Twitter campaign on the importance of scientific research (but don’t have a structure currently to engage with that). This needs to be a priority and there needs to be someone (or a designated team) to do the work. We need an efficient process to get information about what’s going on in research areas. This takes a variety of skills: someone from research, marketing and communications, government relations = purpose of team is to promote research nationally.
  o When promoting ourselves nationally, mention that we’re an HSI.
• What do you think are the characteristics of the successful RPSPs (e.g., UNM Utton Center or programs like the Water Resources & Research Institute at NMSU)?
  o Good to show that something we’re doing has a statewide impact or benefit (and influence); programs that benefit students.
  o Finding a problem and finding out how we can be a solution for it. E.g., degree transfer among 27 different higher education institutions. Students were wasting credits and the Provost’s office was working on it for UNM and expanded the effort to the entire state. See what’s important to legislature and respond.
• What are ways that you think the research community at UNM can strengthen ties with state and federal policy [decision] makers and the national laboratories?
  o The most effective way is to have a structured process that is centralized through the VPR office to have a unified voice on what the priorities are. Research Office should be the lead to engage the research community on campus to know what we’re doing and where we can go – what are we growing – what are we starting that’s new? This process is most effective if individual researchers aren’t going out and advocating their individual causes.
• What other comments would you like to make?
  o There are great opportunities from a government relations perspective to advance the research mission at UNM, and the research strategic plan will be very helpful for the government relations staff to provide the greatest benefit to the research office.
• Do you have any questions for us?
  o No.

Conclusion
Thank you for your valuable time. We appreciate your input. The research strategic plan, when developed, will become the road map for research over the next five years at The University of New Mexico. You can learn more about the planning process at http://research.unm.edu/research-strategic-plan.
Appendix C: Sponsored Research Interview Protocol
Interviewer Name and Title: Karl Benedict
[Note to Interviewer: Confirm interviewee’s name and title.]

Introductory Protocol
My name is Karl Benedict, and I am conducting this interview on behalf of the Government Relations Working Group of the UNM OVPR Research Strategic Planning Committee. To facilitate our note-taking we would like to record this conversation. We respect your privacy; only members of the Government Relations Working Group will have access to this recording and your individual responses. Responses that could identify you will be held confidential. The recording will be destroyed after it has been transcribed and we have had the chance to contact you to clarify a response or to ask further questions. Your responses will be summarized and shared with the larger Strategic Planning Committee as part of the process of integrating the outcomes of all of our interviews into working group reports and the overall research strategic plan. We have planned this interview to last no longer than one hour. Thank you for agreeing to participate.

Introduction
The Office of the Vice President for Research at UNM is developing a research strategic plan to provide the strategic framework under which UNM’s main campus research enterprise will be managed for the next five years. For our purposes, research refers to systematic and original investigations to generate, develop, and validate new knowledge or solutions to contemporary problems. Research involves scholarship—the critical and accurate synthesis and dissemination of knowledge and of creative works in the arts, literature, or professions. The governmental relations working group is one of several teams focusing on different aspects of the strategic plan. In particular, our working group is specifically examining the relationships with local, state, and federal funding and other agencies; federal laboratories (including our two national labs); and state and federal legislative processes. As part of this examination we seek to characterize these relationships, the outcomes of these relationships, and identify areas for improvement. Your input is vital to this process.

Questions
1. How long have you been:
   a. In your present position?
   b. At UNM?
2. Briefly describe your role:
   a. In teaching.
   b. In research.
3. How do you see UNM’s relationships with federal, state, and local government agencies impacting (positively or negatively) our institutional success in competing for sponsored research funds?

4. What do you see as the most productive strategies for improving UNM’s competitiveness for sponsored research support? Particularly in the area of our institutional or other relationships and connections with government agencies.

5. What role do you see in the development of UNM’s legislative priorities (state and federal) in supporting the success of sponsored research at UNM.

6. What are ways that you think the research community at UNM can strengthen ties with state and federal policy makers and the national laboratories?

7. In what research areas do you see the most potential growth in interest and support over the coming 3-5 years?

8. In what research areas do you see potential for decline in interest and support over the coming 3-5 years?

9. What other comments would you like to make?

10. Do you have any questions for us?

Conclusion
Thank you for your valuable time. We appreciate your input. The research strategic plan, when developed, will become the road map for research over the next five years at The University of New Mexico. You can learn more about the planning process at http://research.unm.edu/research-strategic-plan.
Appendix D: Interview Summary related to Contract Funded Research [centers]

Meeting Date: January 30, 2017
Interviewer Name and Title: Melissa Binder, Karl Benedict
Interviewees present: Staff from the Earth Data Analysis Center (EDAC), the Institute for Social Research (ISR), and the Center for Education Policy Research were interviewed.

Written responses received from staff at the Bureau of Business and Economic Research (BBER)

Respondents have served in their present positions for 3 months to 2-½ years, and have been at UNM from 13 to 27 years.

Summary of discussion
Contracts with government agencies at all levels account for 50% or more of the revenue for all centers. The estimate for EDAC is 80-85%.

Among the government partners are:
- City of Albuquerque
- NM Department of Finance and Administration (DFA)
- Bernalillo County
- Department of Information and Technology
- NM Children Youth & Families Department (CYFD)
- Public School Facility Authority (PSFA)
- NM Public Education Department (PED)
- USGS
- NM Higher Education Department (HED)
- Legislative Education Study Committee (LESC)
- US Department of Transportation
- Council of Governments (COGs)
- NM Department of Public Safety (DPS)
- NM Department of Health (DOH)
- US Department of Labor
- Office of the State Engineer (OSE)
- US Department of Education
- NM Department of Homeland Security and Emergency Management (DHSEM)
- FEMA
- NM Environment Department (NMED)
- Albuquerque Public Schools
- NM State Auditor
ABC Community Schools
NM Attorney General
NASA
NM Tax and Revenue Department (TRD)

The Centers benefit the state by:
- providing expert research services and access to cutting edge technologies;
- contributing independent scientific analysis to policy debates;
- assembling and responding to requests for data from government agencies;
- testifying before legislative bodies;
- building government capacity to manage and report data;
- training analysts.

1. The Centers benefit the University by:
2. generating good will in the state;
3. demonstrating the University’s commitment to the state;
4. generating positive publicity, as when “UNM’s BBER” publishes an economic impact study or “researchers from UNM’s Institute for Social Research” conduct research for the Albuquerque Police Department on body cameras;
5. providing research opportunities for students;
6. bringing in revenue.

The Center directors all reported serious administrative challenges related to contracting. One characterized the challenges as “an accounting nightmare.” Another said that the University had lost hundreds of thousands of dollars due to its slow and sometimes tortuous contracting process. UNM-State contracts are particularly difficult to complete due to the reinvention of the wheel with each new contract.

Proposed remedies include:
1. Negotiate Master MOU’s with the state and other agencies that contract with the Centers. According to the Directors, HSC has managed this task with DOH and CYFD. In the recent past, a data sharing agreement signed by the presidents of UNM and CNM and the APS superintendent greatly reduced the administrative burden for education research projects. An MOU between the national laboratories and UNM allows for the quick execution of projects.
2. Assign staff in the contracting offices to work with Center directors and prioritize resolution of longstanding issues on administrative delays.
3. Grant signature authority to Directors for contracts under $60,000.
4. Return enough F&A to Centers to support the administrative burden of managing many complex contracts.
5. Another shared challenge is lack of recognition for the groundbreaking research and supportive state role taking place in the Centers.
2. Proposed remedies include:
5. Recognition of the value of applied research, including in the promotion and tenure process.
6. Returning enough F&A to support scholarly activity, including the preparation of academic manuscripts and conference presentations.
7. Recognition that the Centers are viewed as a state asset and that fulfilling requests from state agencies and testifying at the legislature serve both to support state functions and to promote the University’s value to the state. These activities need to be supported—and financed—by the University.

Objectives and Tasks

Objective 1: Reduce the administrative burden on applied research centers.

Task #1-Convene a working group composed of Center directors and VPER staff that develops a plan for (a) negotiating Master MOU’s with the State and other government entities that contract with the Centers, (b) resolving contracting issues involved with time-sensitive projects, and (c) considers F&A return policies consistent with the increased administrative burden of managing multiple and complex contracts, (d) work towards update the currents Regent policy ### for small contract signature authority to align with the state’s policy on d) work towards update the currents Regent policy ### for small contract signature authority to align with the state’s policy on the cap for agency level awards, which is $60,000 (http://www.generalservices.state.nm.us/statepurchasing/FAQs_1.aspx).

Objective 2: Recognize the value of applied research and expert support in serving the state.

Task #1-Create a fund from the VPER’s top slice to support scholarly activity by Center researchers and to fund staff time devoted to fulfilling state requests for data and to testifying before the state legislature and other public bodies.
Task #2-Encourage the participation of tenured and tenure-track faculty in Center projects by broadening the definition of research in tenure and promotion guidelines to include applied research projects.

Addendum: Interview Questions
1. How long have you been:
   a. In your present position?
   b. At UNM?
2. Describe your involvement with research contracts for government entities.
3. What is the importance of these contracts to your organization? To the University? To the state?

4. What are the challenges to securing and completing these contracts?

5. What does or could UNM do to help with securing and completing these contracts? What is UNM doing well and what could be improved?

6. Is there potential to increase the volume and/or impact of this work both in the near-term and beyond? What should UNM do to position itself to undertake this work?

7. In our group’s interview with the government relations folks at UNM, they said it helps them when they can highlight UNM activities that have a statewide impact or benefit. Is your work known to the UNM Office of Government Relations? How could UNM best capture and communicate the impact of your work more broadly? To whom should this communication be directed?

8. What are ways that you think the research community at UNM can strengthen ties with state policy makers?

9. Are we missing anything?

10. Do you have any questions for us?
Appendix E: Federal Laboratory Interview Questions

Interview Questions: UNM Partnerships with National Laboratories

- **Big picture – existing partnerships and vision for future**
  - It what ways does your institution already partner with UNM?
  - What are effective models/programs/strategies for increasing linkages between UNM and the national laboratories?
    - What is the role of the New Mexico Consortium in facilitating partnerships between the UNM and the national laboratories?
  - What is your general vision for future partnerships between UNM and the labs?

- **Joint Projects**
  - What are the research topic areas that you think have the greatest potential for collaboration between UNM and the national laboratories?
    - Are there some specific examples of ongoing joint research in these areas?
  - What are some of the challenges to funding collaborative projects between universities and the national labs? How could we address these challenges?
  - What role do you see for students and postdocs in joint projects and how can we effectively facilitate this?

- **Joint and adjunct hires**
  - What is your opinion of joint hires as an effective tool for increasing linkages between UNM and National Laboratories, e.g., as called for in the MOU between Sandia and UNM?
    - What challenges do you see, given the differing missions of institutions?
    - What is the role of a joint hire – attracting an established leader to UNM/SNL, retaining an existing Sandia staff member, bringing a more junior person to UNM/SNL to fill existing needs, other?
    - How do we ensure mutual hiring priorities and success of these hires, given the differing demands of the institutions?
  - What is the role of faculty adjunct positions for national lab staff in establishing linkages?
    - UNM has a special letter of academic title – National Laboratory Professor. What role do you see for this title?

- **Lab staff recruitment and retention**
  - How can UNM/Lab partnerships help in recruiting and retaining technical and non-technical staff?
    - What is the role of students?
    - What is the role of adjunct positions and joint hires?

- **Miscellaneous topics**
  - What role do you see for the labs in education?
- Lab employees teaching classes?
  - Students performing dissertation research at labs?
  - Are there specific areas where the labs and UNM could work together to better promote tech transfer?
  - What would be your advice to an incoming UNM President or Vice President for Research about developing strong partnerships with the national labs in New Mexico?
Appendix F: Interview Summary related to National Laboratories

UNM Partnerships with National Laboratories

New Mexico benefits from a rich environment of federal and national laboratories including the Air Force Research Laboratory (AFRL), Los Alamos National Laboratory (LANL), and Sandia National Laboratories (SNL). The proximity of the labs to UNM, the flagship research university in New Mexico, thus provides unique opportunities for partnerships that mutually benefit the research missions of the respective institutions.

We review here the existing partnerships, new opportunities going forward, and some key takeaway findings that inform our recommendations for the research strategic plan. Our findings and recommendations are based on a Roundtable Discussion conducted by members of the Working Group on Governmental Relations, Ivan Deutsch and Anne Jakle, on December 5, 2016.

In attendance were senior staff from Sandia National Laboratories, Los Alamos National Laboratory, the Air Force Research Laboratory, New Mexico Consortium.

Findings
- Existing agreements and partnerships between the labs and UNM:

AFRL has had a Strategic Educational Partnership Agreement (EPA) with UNM since 2011; a renewal may be necessary soon. This allows for sharing and gifting of equipment and establishing joint research programs. AFRL is a strategic partner in Innovate ABQ and is enthusiastic about this project. Its tech transition office will be moved from behind the fence on Kirkland Air Force Base to a new 2000 square foot space on the Innovate ABQ site. The Air Force Office of Scientific Research (AFOSR) has funded basic UNM research at approximately $12M over a three-year period (2012–2014).

LANL has had a long history of partnership with UNM with formal agreements under a current MOU, and discussions are ongoing with the Provost’s office for a new more specific Institutional Agreement. UNM is LANL’s largest research contract customer and staffs LANL’s scientific and administrative functions more than any other university. The New Mexico Consortium (NMC), a 501(c)(3), provides additional mechanisms for fostering joint activities between LANL and UNM, including joint appointments for LANL staff at NMC to carry out collaborative research at UNM, mechanisms for UNM faculty to have a sabbatical at LANL, support for joint research proposals, and support for workshops.
SNL has recognized UNM as one of its five Academic Alliance schools (together with Purdue, Georgia Tech, University of Illinois Urbana-Champaign, and the University of Texas Austin). The current MOU and other formal agreements renew the SNL/UNM partnership. UNM and SNL jointly occupy the Advanced Materials Laboratory (AML), which serves as a gateway facility for the Engineering School and South Campus. There are currently three UNM professors with true joint appointments as SNL scientific staff, and the current MOU calls for potential additional joint hires in areas including cyber security, high energy density science, and quantum information science. UNM is the largest university recipient of Laboratory Directed Research and Development (LDRD) funds through contracts on collaborative research.

- Areas of current joint research and opportunities for growth:

AFRL: A key area of collaborative research with UNM is Directed Energy (lasers, optics, high-power electromagnetics), as represented, for example, by the Applied Electromagnetic Group that receives a $1M/yr grant to study high power electromagnetics. There are opportunities to expand this collaboration, particularly in the areas of ultra-short lasers and optics with CHTM and the Optical Science and Engineering program. Another key area of joint activities is Space Systems, including building and launching space vehicles and the associated science.
Working Group Report VI: Corporate Relations

Dr. Edl Schamiloglu Addressing The Complexity of Corporate Relations
Members: Gabriel Lopez (VPR, Chair), Steve Brueck, Jeremy Edwards, Michele Huff, Lisa Kuuttila, Edl Schamiloglu, Wendy Stires. Special thanks to Richard Larson, Jeffrey Norenberg, Eric Prossnitz and Angela Wandinger-Ness for valuable input and participation in discussions.
GOALS

The broad goal of this group was to examine the current range of industrial interactions at UNM and propose new ways in which UNM can dramatically increase corporate-sponsored research. The group focused specifically on enhancing sponsored research agreements and gifts directly from corporate partners. It did not focus on enhancing SBIR/STTR funding, IP licensing and start-up formation, industrial service agreements, nor clinical trial agreements. Means to achieve the broad goal included: (i) reviewing academic corporate relations initiatives nationally and at selected exemplar institutions; (ii) identifying and assessing current mechanisms by which UNM is successful in securing industrially funded research, as well as barriers to such success; and (iii) reviewing institutional infrastructure at UNM (specifically OVPR, STC.UNM, UNM Foundation, OSP and OUC) for effectively engaging with corporate sponsors of research and identify best practices for approaching corporations, intellectual property agreements, publication agreements and contracting.

METHODS

The members of the Corporate Relations Working Group used a variety of methods to collect relevant data. Group members documented current activity in corporate-funded research at UNM and reviewed 13 different articles, papers, and other documents related to corporate relations in universities (see Appendix A). Group members identified seven universities that UNM aspires to emulate and reviewed their corporate relations websites to gather pertinent information (see Appendix B). Members also identified six universities, some of which were included in the first list of seven universities, and interviewed faculty members or administrators at those universities regarding their corporate relations offices and their corporate-engagement procedures (see Appendix C). An interview protocol was developed and used for consistency of questions and information being solicited (see Appendix D). Finally, the members conducted an analysis of strengths, weakness, opportunities, and threats (SWOT) facing enhancement of corporate-funded research at UNM.

FINDINGS

Current and historical corporate funded research at UNM Main Campus. Investigators at UNM have secured funding through, and executed research in, a range of types of corporate interactions. Funding mechanisms have included, for example, (i) direct sponsored research agreements (SRAs), (ii) industry sponsored research consortia (memberships) in particular subject areas (iii) SBIR and STTR partnerships with corporations for joint federal funding in which UNM is a subcontractor, (iv) other
federally funded projects in which UNM is a subcontractor to larger corporations, (v) direct contract for service agreements, and (vi) research performed through patent royalties, gifts and endowments. As many of the national laboratories are managed by private corporations, research contracts from national laboratories can also be considered a form of corporate-funded research (for more details see report of Working Group on Federal and State Government Relations).

In total, research expenditures from corporate sources (including the national labs) over the last five years at UNM have varied from a low of $8.3M to a high of $10.2M (see Figure 1 below). During FY2016, this represented 6.9% of the overall research expenditures. The dominant source of these funds to UNM is from federal agencies, which UNM receives through subcontracts either from the national labs, small corporations (e.g., SBIR/STTR programs) or large corporations (e.g., defense contractors). Direct funding from private industry is a relative minor source, with expenditures ranging from $1.3M to a high of $3.2M. Appendix F provides a list of all corporate-sponsored sources for FY 2016.

![Figure 22: Annual Research Expenditures from Corporate Sources](image)

**Findings of the Environmental Scan**

While it is currently a relatively minor funding source for UNM, industry plays a substantial role in research in the US. Industry funding for research in constant dollars increased by more than 300% during the period 1992-2012 while the other sources have remained relatively flat (see Environmental Scan, Fig. 5, p. 19). The data provided
in the Environmental Scan suggest that research funding from industry is more focused on applied research than on basic research. Industry-sponsored research focused on development appears centered in specific areas that are advantageous to industry and often change rapidly. For example, a 2012 news article reported that in 2008, 70% of industry-sponsored research in the US was from the manufacturing sector. The National Science Board’s 2016 Science and Engineering Indicators report found that manufacturing now accounts for 84% of total industry-sponsored research. Another recent news article reported that almost 75% of all clinical trials are funded by industry. This suggests universities that have specializations matching industry needs are better positioned to receive industry funding.

**Interviews**

As mentioned above the members of the Working Group conducted interviews with individuals at six selected universities regarding their corporation relations activities. Summaries of interviews are available in the Appendix. The key findings and action plan below have been informed by findings from the interviews.

**SWOT Analysis**

**Strengths**

A major strength is our research faculty and research centers that perform a substantial amount of funded work with corporations. As mentioned above, these interactions take place through several mechanisms. STC.UNM and the UNM Foundation provide routine conduits for research-active faculty members to gain access to corporations, and Innovate NM is an emerging venue for routine interactions between faculty and industrial personnel interested in developing collaborations. Moreover, the diversity of our student body and workforce is also an important strength, as is our proximity to and relationships with the federal laboratories.

**Weaknesses**

The university does not currently have an office or individual solely dedicated to developing relationships with corporations. This limits UNM’s ability to attract corporate sponsors because the industrial base of New Mexico is relatively small compared to those of our peer institutions, and so reliance on chance encounters between investigators and potential corporate sponsors is of limited effectiveness. Another weakness is that processes and services for funded research are largely focused on working with federal government and UNM infrastructural research resources in general have not been well developed for working with corporations. There are no clear guidelines for developing contracts and grants with corporations; nor is there a grants and contract administrator familiar with, or dedicated to, executing contracts with
corporations. This represents a barrier and the progress of interactions with potential corporate partners and contract negotiations often stall before fully executed.

Opportunities
There is substantial untapped potential for the OVPR to work more effectively with STC.UNM and the UNM Foundation, as well as OSP, OUC and Career Services to coordinate, streamline and synergize efforts. Together, these offices can provide a facile, full service interface between investigators and potential corporate funders in a manner that is efficient and optimally responsive. Our alumni in corporations across the country represent a substantial opportunity that can be systematically engaged.

Threats
The data presented herein suggest that other universities (both some of UNM’s peer institutions and “exemplar” institutions) are attracting much higher levels of corporate-funded research. This may be because New Mexico has a relatively small industrial base and UNM lacks human resources dedicated toward the task of generating and maintaining corporate relations. The relatively low current level of industrial research funding compared to other sources (e.g., federal) also suggests that investment of new human resources in corporate relations may not be as profitable as investment in other areas. Finally, a significant threat associated with SBIR and STTR sub-awards has been that default on such contracts by small businesses can result in so-called unreimbursed costs (“bad debt”) that the OVPR must cover.

Key takeaways
The key findings and takeaways from the Working Group’s deliberations are as follows: There is substantial and growing opportunity nationwide to tap corporations to fund university research and UNM can emulate at least some of the mechanisms that other top universities are using successfully.

Currently, corporate funding is a small piece of UNM’s sponsored research pie, but it is one with significant growth potential. Given the limited resources available for investment in research infrastructure, it is imperative that efficiencies be identified in current operations that can be dedicated to growing corporate-sponsored research. UNM already has resources in place that routinely interact successfully with corporations to result in sponsored research and thus enhance UNM’s research mission. These include STC.UNM, the UNM Foundation and a variety of university wide and college-based research centers. Successful partnerships and coordination between these organizations can result in synergies leading to enhanced corporate engagement and suitable incentives can encourage cooperation and result in win-win opportunities.
In the past, OVPR has been more proactive in engaging with corporations, including maintaining a web infrastructure which targeted industries that might be interested in “Doing Business with UNM.” Such a web portal should be reinstated and linked to all relevant UNM organizations. It should go beyond the previous version (which provided links to important forms, e.g., NDAs, and policies) and provide links to all units that engage corporations across the UNM campus. It can also provide, in a user-friendly, easily searchable manner, a guide to particular expertise of faculty members that are likely to attract industry business. For example, profiles of faculty members with particular expertise in manufacturing could be one part of such an “Experts Registry.”

Currently OSP (Pre-award and Post-award) does not have personnel that are tasked with engaging, negotiating and executing agreements, grants and contracts with corporations. Instead, their personnel are generally assigned to particular university units and are expected to handle all sponsored research for their assigned units. Because the majority of OSP’s business is with governmental funding agencies, personnel tend to focus on building expertise in working with these sources. OSP could enhance UNM’s ability to work with corporate sponsors of research by making sure at least some personnel develop facility and expertise in engaging businesses and negotiating corporate contracts in a streamlined fashion. These "corporate-interaction-trained" personnel should be available to all units as the need arises.

UNM should marshal and coordinate all the above-mentioned units and resources to optimize, synergize and maximize corporate-funding of research. Best practices can be learned from the interviews and data provided in the Appendices.

**ACTION PLAN**

The above findings suggest that UNM embark on the following three strategic objectives and their associated tactics to achieve the goal of dramatically increasing corporate-sponsored research.

**Objective 1: Establish A Cross-Campus Roundtable For Corporate-Sponsored Research.**

**Task 1.A.** Convene a Roundtable (i) to optimize current campus infrastructure to maximize effectiveness of corporate relations and corporate-sponsored research, and (ii) to provide a regular forum for informational exchange regarding corporate relations. The Roundtable should include representation from OVPR, STC, UNM Foundation, OUC, OSP (pre-award and post-award), Career Services and ADRs for relevant colleges (e.g., SOE and A&S). The Roundtable will have a formal charge and regular
meetings (e.g., at minimum monthly) as well as a listserv for communications as needed between meetings.

Metrics: For continuation, establishment of the Roundtable should increase corporate-sponsored research 10% per year, on average, over the next 4 years.
Timeline: The Roundtable will be established no later than July 1, 2017 and continue operations at least through June 30, 2018. Performance will be evaluated by June 30, 2018 by an Executive Board comprised of the leadership of the participating units.

**Task 1.B.** The Roundtable will transition into a formal Internal Advisory Committee (IAC) for a virtual Office of Corporate-Sponsored Research. The virtual Office will help develop and take full advantage of the UNM Web Portal for Corporate-Sponsored Research (see Objective 2). The virtual Office will be led by a Director who will be chosen by the Roundtable.

Metrics: Traffic to the virtual Office will be monitored and analyzed for potential correlations to increases in corporate-sponsored research. Specific functions and components of the virtual office that are particularly effective will be bolstered.
Timeline: The virtual Office will be in place and fully operational by June 30, 2018 and will operate at least through June 30, 2021 (unless funding for a non-virtual Center is secured). Its performance will be evaluated annually by the Executive Board described in Task 1. A.

**Task 1.C.** Secure funding for dedicated personnel for the Office of Corporate-Sponsored Research. The Roundtable / IAC of the Office of Corporate-Sponsored Research will seek funding (internal and external) to provide staff support for the Office’s functions.

Metrics: Proposals and grants for internal and external funding to support the mission of the Roundtable/IAC will be monitored and fostered. These proposals can be from any of the units supporting the Roundtable/IAC.
Timeline: The virtual Office will secure funding for the Director (e.g., a SAC) and two staff positions by June 30, 2020.

**Objective 2: Establish A Comprehensive UNM Web Portal For Corporate-Sponsored Research**

**Task A.** The Roundtable/IAC will construct a user-friendly, easily searchable web portal that will form the basis of a virtual UNM Office of Corporate-Sponsored Research. The homepage will provide a comprehensive compendium of possible UNM-corporate interactions and provide a means to facilitate the spectrum of such interactions. For each type of interaction, the homepage should provide links to the appropriate,
cognizant UNM resources/units (e.g. OSP, STC, UNM Foundation, OUC, OSA). The Portal should also include an updated list of current and past corporate partners, so that such partners (especially big corporations) can gain confidence in UNM as a productive partner.

Metrics: Traffic to the UNM Web Portal will be monitored and analyzed for potential correlations to increases in corporate-sponsored research. Specific functions and components of the virtual office that are particularly effective will be bolstered.

Timeline: The Web Portal will begin as soon as possible and will be fully operational by June 30, 2018 and will operate at least through June 30, 2021. Performance will be evaluated annually by the Executive Board described in Task 1.A.

Task B. Add to the Web Portal easy access to UNM policies (e.g., IP policies, indemnification policies, F&A policies) so that industrial sponsors can have easy access to the basic conditions by which UNM can engage in sponsored research and clear explanations of the reasons for these policies. A closely related part for each type of industrial interaction will be PDFs of the standard versions of the various contracts/forms (e.g. NDAs, SRAs, MTAs) that UNM uses.

Metrics: Traffic and downloads to these parts of the UNM Web Portal will be monitored and analyzed for potential correlations to increases in corporate-sponsored research. Specific functions and components of the virtual office that are particularly effective will be made more prominent on the Portal's homepage.

Timeline: The Web Portal will begin as soon as possible and will be fully operational by June 30, 2018 and will operate at least until June 30, 2021. Performance will be evaluated annually by the Executive Board described in Task 1.A.

Task C. Add to the Web Portal an Experts Registry that will allow prospective industry sponsors to easily gain knowledge about the capabilities of UNM investigators and infrastructure facilities that are of potential benefit to their business mission.

Metrics: Traffic to this part of the UNM Web Portal will be monitored and analyzed for potential correlations to increases in corporate-sponsored research. Participating investigators and infrastructure facilities will be surveyed to obtain their views of the effectiveness of the Experts Registry.

Timeline: Gathering of data from campus constituents will begin on July 1, 2017. A fully functioning Experts Registry will be operational by June 30, 2018 and will operate at least until June 30, 2021. Performance will be evaluated annually by the Executive Board described in Task 1.A.
Objective 3. Establish new model for OSP (Pre-Award and Post-Award) to facilitate Corporate-Sponsored Research.

**Task A.** The Roundtable/IAC will work with OSP to identify CGAs in Pre-Award that are (or will be trained to become) expert in engaging with industry and negotiating corporate funded research contracts. Depending on increase in demand, 1 or 2 CGAs will be given explicit job duties that allow them to facilitate corporate-funded research across the main campus. These duties will include interfacing with OUC as necessary on complex contract negotiations.

Metrics: Turnaround time for completion of negotiations with corporate research funders will be monitored and correlations with increases in corporate funding rates will be sought.

Timeline: Conversation with OSP management on this task will begin as soon as the Research Strategic Plan is completed. New job duties should be in place by July 1, 2017. New CGA duties will be in place by July 1, 2017 and depending on effectiveness of this tactic, will operate at least through June 30, 2021. Its performance will be evaluated annually by the Executive Board described above.

**Task B.** The Roundtable/IAC will work with OSP to identify contract fiscal monitors (accountants) in Post-Award who are expert in regulations regarding corporate-sponsored research including fixed price contracts. Depending on increase in demand, 1 or 2 CGAs will be given explicit job duties that allow them to facilitate corporate-funded research across the main campus. These duties will include interfacing with Purchasing, HR and other UNM departments as necessary to implement nonstandard contracts.

Metrics: A set of principal investigators who routinely secure corporate-funded research contracts will be chosen as a “focus group” and will be surveyed as to their satisfaction in new processes implemented and their recommendations for further improvements.

Timeline: Conversation with OSP Management on this task will begin as soon as the RSP is completed. New job duties should be in place by 07/01/2017 and depending on effectiveness of this tactic, will operate at least through
06/30/2021. Its performance will be evaluated annually by the Executive Board described in Task 1.A.

Task C. The Roundtable/IAC will work with OSP (Pre-Award and Post-Award) to minimize and mitigate instances when companies default on payments for services in subcontracts (e.g., in SBIR and STTR Programs). In Pre-Award, such subcontracts can be negotiated to be either fixed price, or so that a minimum amount of the subcontract is provided up-front (e.g., 50%) to minimize the threat of default on the subcontract. In Post-Award, billing for services rendered can be expedited on a monthly basis and, if payment is not made within a specified number of days (e.g., 15 days), performance of the contract can be stopped.

Metrics: A set of principal investigators and contract managers who routinely secure and administer corporate-funded research contracts will be chosen as a “focus group” and will be surveyed as to their satisfaction in new processes implemented and their recommendations for further improvement.

Timeline: Conversation between OVPR and OSP management on this task will begin by July 1, 2017 and new policies will be in place by July 1, 2018. Depending on effectiveness of this tactic, it will operate at least through June 30, 2021. Its performance will be evaluated annually by the Executive Board described in Task 1. A.

FURTHER RECOMMENDATIONS

New Mexico and UNM’s current economic climate prevents full implementation of all of the action plans considered by the Working Group. As our financial situation improves, the following Objectives should be executed to fully realize the mission of optimizing productive relationships with corporate partners. Another option is to begin a development campaign to identify donors who understand the importance of UNM’s research to the industrial community and who can provide seed or matching funds for the following objectives.

Based on the success of the above plan the UNM should establish a (non-virtual) Office of Corporate-Sponsored Research with permanent staff. This Office will employ staff dedicated to maintaining and strengthening productive relationships with industry as well as working strategically with other stakeholders on campus (e.g., OVPR, STC, UNM Foundation, ISS) to establish new corporate relationships.

FUTURE DIRECTIONS

None at this time.
Appendix A: List of Articles, Papers and Other Documents

Principles to Guide Academy-Industry Engagement, American Association of University Professors.
Appendix B: Information on Corporate Relations at 7 Selected Universities from Their Websites

University of California, Irvine
Thomas Antunez, Executive Director of Corporate Relations, University Advancement
http://www.ucifuture.com/give/corporate-relations-index.php

School of Engineering has a Corporate Relations Office
Shana Chance, Director of Corporate Relations, schance@uci.edu, (949) 824-3977
Business and industry partners play a significant role in UC Irvine success. Corporations provide financial resources for everything from scholarships faculty and student research to facility improvements. In addition, corporations provide opportunities for students and faculty through post-graduate employment, internships, faculty grants and sponsored research. In return for their support, corporations gain many competitive advantages, such as these:
Strengthening ties to one of the top nationally ranked public research universities
Supporting and accessing pertinent research and technology
Working with students and faculty
Playing a lead role in the Orange Counties economic development
Gaining a head start in attracting UC Irvine graduates to their workforce.
The Corporate Relations staff serves as the liaison between UC Irvine and corporate leaders. We become a point of entry into the university community, helping you to identify areas of need and interest; to establish and develop relationships with faculty, researchers, students and staff; and to build partnerships based on mutually beneficial opportunities.

University of Wisconsin
Richelle Martin, JD Assistant Director and Contracts Specialist
https://research.wisc.edu/projectagreementsip/oip/

College of Engineering has a Corporate Engagement Office
Justin Hines, corporate relations manager, (608) 262-0578 or jhines3@wisc.edu.
Industry-sponsored research at the University of Wisconsin–Madison comprises an important component of our research portfolio. Of the more than $1 billion in annually received research funding, business sponsorship accounts for $34 million. Nevertheless, significant potential for increasing the number and value of industrial partnerships exists. To foster this growth, the university established the Office of Industrial Partnerships (OIP) in 2012. OIP works with companies whose interests range from access to cutting-edge basic research to technology commercialization. OIP provides institutional review and negotiation of agreements supporting these
relationships, and serves as a point of contact for UW investigators and industry partners. We offer a flexible and individualized approach to establish industry partnerships while upholding the university’s missions related to education, research, and public service.

OIP is guided by an Advisory Committee that includes UW–Madison faculty and industry representatives and works closely with other campus offices, including the offices of Research and Sponsored Programs, Administrative Legal Services, Corporate Relations, and Research Compliance, as well as the UW–Madison Law School’s Law & Entrepreneurship Clinic and the university’s designated patent management organization, the Wisconsin Alumni Research Foundation (WARF).

OIP also provides a variety of outreach options. Please refer to the Outreach & Events topic page for more information, or to the Find Your OIP Contact page for individual questions.

University of Maryland
Brian Darmody Associate vice president for corporate and foundation relations
http://www.umaryland.edu/development/corporate-and-foundation-relations

School of Engineering has a Corporate Relations Office
Associate Director, Corporate & Foundation Relations
3216 Jeong H. Kim Engineering Building
Email: kpalumbo@umd.edu
Phone: (301) 405-2150

Brain Darmody is charged with leading essential university-wide efforts to develop strategic partnerships between the University of Maryland and the corporate and foundation community.

Darmody will steer the efforts to better align UMD’s internal resources for corporate partnerships, expand outreach to corporations and foundations across the country, and magnify UMD’s external visibility to provide an integrated ‘One Stop Shop’ for corporate and foundation connections.

University of Minnesota
Erik Thurman, Vice President
http://give.umn.edu/giving/cfr/staff

School of Engineering has a Corporate Relations Staff
Brenna Sonke, Director of Corporate and Foundation Relations
612-625-6874 • sonke@umn.edu

Corporate engagement
The Corporate and Foundation Relations (CFR) team at the University of Minnesota Foundation serve as relationship managers for corporations and manages system-wide partnerships. Working collaboratively with all key stakeholders, CFR aligns University and industry priorities to yield mutually beneficial results. Because many companies have multiple interests and activities campus- and system-wide, CFR partners with the President’s office, Office of Vice President of Research, Provost’s office, Sponsored Project Administration, Office of Technology Commercialization, and University Economic Development to provide coordinated industry relationships.

The U of M Foundation’s CFR team can help you:

Connect
Match industry interests and needs to University expertise that will help facilitate research, education, outreach, and workforce partnerships.
Connect you with campus-wide talent recruitment resources.
Engage students through K-12 workforce development, mentoring, and internships.
Engage corporate leadership and employees through executive and continuing education and collegiate advisory boards.
Facilitate corporate giving recognition opportunities.
Convene
Plan and execute corporate visits and events.
Advise and coordinate corporate giving opportunities in conjunction with development professionals, deans, and directors.
Link public and private stakeholders interested in partnering in global challenges.
Collaborate
Partner with the following offices at the University of Minnesota.
- Career Services
- Office for Equity and Diversity
- Office for Public Engagement
- Office for Technology and Commercialization
- Office for Economic Development
- Office of the Vice President for Research
- Sponsored Projects Administration

Massachusetts Institute of Technology
Karl Koster, Executive Director, Office of Corporate Relations
http://web.mit.edu/industry/ocr.html

MIT’s Office of Corporate Relations aids and directs companies interested in pursuing significant, multi-year, multi-disciplinary involvement with the Institute. OCR’s expert staff works with MIT senior administration, faculty, and company executives to structure
and define individualized alliances that mutually benefit the company and MIT. The result is a holistic industry/university relationship that addresses broad needs and interests, from specific research projects and initiatives, to executive education, technology licensing, and recruitment.

OCR, the organizational parent of the Industrial Liaison Program at MIT, can be instrumental in providing connections to MIT faculty, departments, labs, and centers. It serves companies across the globe and is organized both geographically and by industry. In addition to corporate partners, OCR also helps regional governmental organizations who look to the unique, entrepreneurial MIT/Cambridge environment as they begin to develop their own regional innovation eco-systems.

Stanford University
Kathy Veit, Senior Director
https://cfr.stanford.edu/

Services We Provide
Facilitate interactions and manage relationships with a broad range of companies and foundations
Work with school-based development officers to coordinate activities that advance institutional priorities
Research and identify prospective funders
Compile RFPs and disseminate targeted opportunities to relevant schools and departments
Assess a project's funding viability and advise on strategies
Prepare briefings in advance of corporate and foundation visits
Review and provide feedback on letters of inquiry, proposals, and budgets
Assist with applications and awards, including supply institutional information, provide required attachments, and help obtain signatures
Support stewardship efforts, including major recognition opportunities and grant reports
Produce monthly newsletter on philanthropy and foundation news for Stanford community

How to Contact Us
Individual contact information is available under "Staff" and "Related Offices"
Please direct general inquiries to Katherine Kaiser at kmkaiser@Stanford.edu

University of Michigan
http://bec.umich.edu/about/bec-overview/
Nell Dority, Senior Director, ndority@umich.edu

Engineering has a Corporate and Governmental Relations Staff
John McLaughlin, Director, Corporate and Foundation Relations
jmmclaug@umich.edu, (734) 936-2106

The corporate engagement office reports to the VP for Research and VP for Development (Fundraising). In addition to the main office staff there are corporate engagement staff in the units. Engineering - 3 corporate staff, Business School - 1 corporate person and Health System has 3. These staff members do not report directly to the corporate engagement office, they report to their respective Deans - but they have month meetings to discuss who is working with what companies and how to best leverage relationships.
Appendix C: List of Interviews of Faculty Members and Administrators At Six Selected Universities

1. University of California – Davis. Dushyant Pathak, Ph.D., MBA, Associate Vice Chancellor Technology Management & Corporate Relations and Executive Director, Venture Catalyst.
   UC Davis campus has a strong foundational IP & Licensing system in place with over 3,000 active contracts currently under management. This has generated over $140M in gross licensing revenue and executed 953 licenses. The campus has received 2,284 invention disclosures and filed over 1,500 U.S. patents applications. Over 375 U.S. patents have been granted since 2004.
   Additionally, UC Davis has a Venture Catalyst unit which works closely with other campus units. Venture Catalyst is catalyzing the translation of University research and technology into the marketplace by driving the successful development of new ventures based on UC Davis intellectual property. Two key elements of this mission are: 1. Direct support of campus entrepreneurs developing university technology, and 2. Effective collaboration with internal & external stakeholders & resources. This has resulted in UC Davis launching 79 companies, of which over 60% still active. UC Davis startups have raised over $160 million in investment capital and these startups have created over 220 jobs.

2. University of Maryland, College Park. Steven Anlage, Director, Center for Nanophysics and Advanced Materials Physics Department and Faculty Affiliate of the Department of Electrical and Computer Engineering and Member of the Maryland NanoCenter, University of Maryland.
   At the University of Maryland (UMD), working with industry is a pretty smooth, straightforward process. It simply works. The University is aggressive about marketing IP. However, they will only support avenues that they feel will bring in a lot of money. Non-Disclosure Agreements take a long time because it is two groups of busy people trying working on the agreement. Average time is approximately 3 months. Contracts are typically done through OTC (Office of Technology Commercialization). If contracts are done via the Foundation grant, overhead is free, which basically means you cut out OTC and the University. Many companies do not want to pay overhead to the University. It is recommended that the University let the companies get the IP in return for stock in the company.
   UMD does not have a person that specializes with industrial contracts. Each Department has their own dedicated pre-award person and they handle all types of grants and contracts. OTC handles IP negotiations exclusively with companies, the pre-award does not get involved. And it typically takes an inordinate amount time to negotiate.
At UMD, the Foundation is used to bring industry fund, but they do not actively help researchers. They tend to focus on philanthropy, but if researchers can steer industry to go through the Foundation they are happy to facilitate.

3. University of Michigan, Ann Arbor. Mark Kushner, Director of the Computational Plasma Science and Engineering Group (CPSEG), Department of Electrical and Computer Engineering, and Director of MIPSE (Michigan Institute for Plasma Science and Engineering) and of the DOE Plasma Science Center.

At the University of Michigan (UM) in the beginning, Intellectual Property agreements were always a stumbling block. The University has become much more reasonable in developing the IP agreements. In the past the University wanted 100% IP if work done on campus. Now the UM seeks middle ground with companies. However, UM still insists on filing patent and maintains 100% of the patent rights. However, UM will give exclusive fee-free use of IP to the company.

Non-Disclosure Agreements are almost instantaneous. Companies send a 2-way NDA. And they are almost never renegotiated. This is a 2-step process. We need to be able to talk before we decide to work on a proposal together. With research proposals, if our IP staff are able to respond quickly IP’s would typically go through 3-4 iterations, which take 4-6 weeks. Also, there are dedicated staff in pre-award that focus on industry contracts.

The UM Foundation focuses solely on Philanthropy. That foundations position is that connecting industry with researchers would violate tax rules for Foundation.

4. University of Minnesota. Rick Huebsch, Office for Technology Commercialization

The University of Minnesota interviewed industry representative and faculty to determine how to improve industry relations and contact negotiations. Both industry and faculty recommend that the university need to make it easier to do business with each other by eliminating protracted negotiations about IP terms and eliminating uncertainty in future financial obligations, and by eliminating confusion through more and better information online. Industry wanted exclusive rights to the IP by eliminating concerns that competitors will license the IP that results from research company funded. Industry also wanted the university to make it easier to evaluate and license IP by minimizing financial risks for licensing unproven technologies.

Additionally, faculty wanted more marketing of more of their technologies, instead of focus on only direct marketing a few technologies. They also wanted greater use of online methods and help with transfer of copyrighted IP, which they viewed as different from classic patent licensing.

The resulted in the creating of “MN-IP Create” for new IP’s via sponsored research, with 3 options: 1. remove IP and financial uncertainty that often surrounds industry funded research projects in a university setting, 2. Created for those sponsors who do not wish
to pay an upfront fee and wish to await creation of IP before negotiating terms – with a 6 month exclusive option period, and 3. For those sponsors who simply need freedom-to-operate and want no future royalty commitments – with a 6 month exclusive option period.

This resulted in sponsored research commitments growing from $2.6M to $10.8 over a five-year period. Invention disclosures, new licenses, Patent filings and patent issued as well as IP agreements and new startups grew dramatically over the same five-year period.

From Conversation with Jay Schrankler, Executive Director, Office of Technology Commercialization, University of Minnesota

UMN has completed a total of 261 agreements under the program, 81 of which were completed in the last fiscal year.

Of the various options, Option A has 63 agreements, Option B has 188 agreements, and Option C, which is new, has 1 agreement.

25% of the companies pick Option A, which is the pre-paid exclusive license option (10% of cost of sponsored research or $15K, whichever is greater).

Of the agreements entered into since FY2012, UMN has entered into 9 Master Research Agreements. A total of 159 companies entered into the 261 agreements.

Sixty-two of the companies entered into agreements in the last FY.

Over the past 4 years, $32.9 million has been secured from industry research; in the past FY the amount was $12.2 million.

As a result of MN-IP Create, the Office of Technology Commercialization has received $1.6 million in option fees over the past 4 years related to MN-IP Create. This has mostly been from revenues from Option A (10% of research funding amount).

Jay was not a fan of adding Option C into the mix, a royalty-free nonexclusive license, for an upfront payment of 10% of the sponsored research cost, or $10K, whichever is greater. He thinks it will be a deterrent for other companies to take a license. He is planning to try some innovative techniques to license other companies.

5. University of Wisconsin, Madison. John Booske, Duane H. and Dorothy M. Bluemke Professor, Vilas Distinguished Achievement Professor, Department of Electrical and Computer Engineering and Richelle Martin, JD, Assistant Director and Contracts Specialist.

University of Wisconsin has a NDA template it ideally takes 3-4 days to complete. The slowest part of the process is the administrative side (WSPR – the Wisconsin version of Cayuse). This can add 1-2 weeks of delay for everyone to submit their approval.

Research agreements take a week or two if the company starts with the Wisconsin research agreement template. The NDA template is on their website and staff are working to get a research template on their website.
Wisconsin negotiates approximately 2000 agreements with industry annually. If they are approached by a company with whom they have had an agreement previously then they go back and use the previously negotiated agreement. They also make sure that the person on the Wisconsin side who negotiated that earlier agreement is the one who negotiates the new one.

When it comes to Intellectual Property, the university bases the IP on inventorship and US patent law. They offer exclusive licensing options to industry in cases where IP is within Wisconsin. Negotiations take longer when you deal with large companies. Subcontracts from industry (say where the prime contract might be from government) take longer because of the flow through requirements.

Below is the url that faculty point industry to for the templates: https://research.wisc.edu/projectagreementsip/agreements/

Data on research at Wisconsin can be found at this url: https://www.rsp.wisc.edu/


At Stanford University (SU) there are many ways to structure the relationship thru sponsored research, gift money, industrial affiliates, and large scale centers. All contracts are negotiated by the Office of Sponsored Research (OSR). However, the Office of Technology Licensing (OTL) is involved in corporate agreements and provides the dedicated experience with industry needs and capabilities that is essential for coming to an agreement.

Soliciting philanthropic money is an industry at Stanford. In one year Stanford had in excess of $4B in donations. The Development office also handles foundations that have limited competitions for sponsored research funds, and seeks out additional opportunities for nonprofit sponsored research.

Stanford has had multiple experiences with industry consortia supporting specific research areas. A typical arrangement was for industry to pay a membership fee of ~$200K/year into a consortium. In return for membership, industry got reports, preprints, notice of IP, on-site meetings and interactions with students and faculty. All of the center members had equal access to the IP generated from the sponsored research. Nonmember companies were offered less attractive IP terms.
Appendix D: Interview Protocol
Interview Protocol
The University of New Mexico is undertaking the development of a research strategic plan. One important component of the strategic plan is to determine relationships that exist between university researchers and corporations. I would like to ask you several questions about such relationships and how they are developed on your campus.

- What is your experience in working with industry?
- How long does it take on your campus to negotiate an NDA with industry? A contract with industry?
- Operationally, how does it work? Who is responsible for the negotiation; is the same group responsible for both federal grants/contracts and industry interactions? Is there a specific person/group responsible for industry interactions?
- How long does it take to negotiate to an IP agreement? Does your sponsored projects office handle this or do you have a separate commercialization entity?
- How well does the university Foundation on your campus work with researchers?
- Does the Foundation identify corporate research opportunities? Or do they focus solely on philanthropy?
- What additional comments do you have?
- Do you have any questions for me?

Thank you for your time. The information you have provided will be very helpful as we move forward in developing a strategic plan.
## Appendix E: 2016 Corporations and Research Expenditures (UNM Main Campus)

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**2016 Grand Total Of Federal And Non-Federal Expenditures** $8,440,199.02