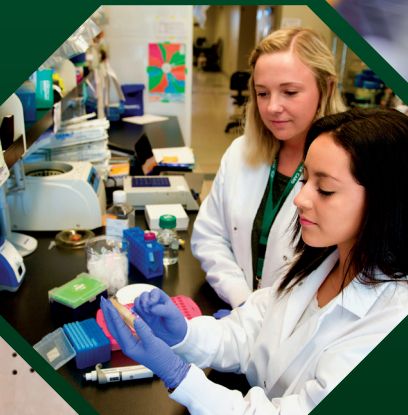
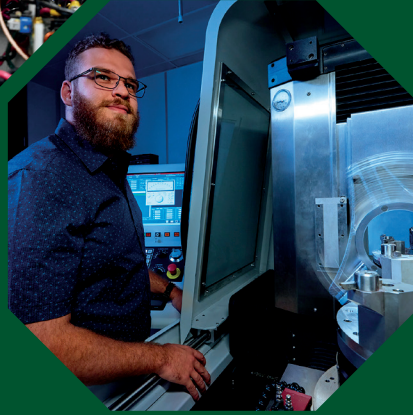
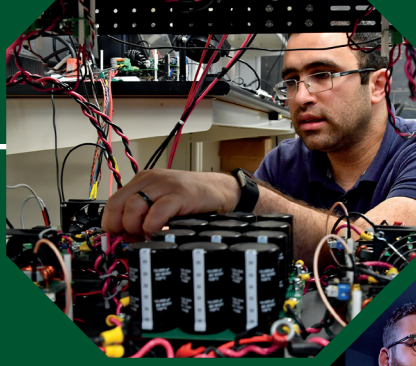


# ROADMAP TO RESEARCH TOP TIER



# Roadmap to Research Top Tier

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## Introduction

In late 2020, UNC Charlotte launched a strategic planning process to set the University's strategic direction for the next five to 10 years. One goal that quickly emerged during planning discussions was to join the ranks of the nation's elite research institutions. With singular and focused commitment to academic excellence, attracting and retaining exceptional students and faculty, groundbreaking research, and high levels of creativity and innovation, outstanding "top-tier" research universities reflect the qualities and values inherent in UNC Charlotte.

Recognition as a top-tier institution will benefit UNC Charlotte and the state and region by raising the University's profile as well as its national and international reputation. Elevating its status will stimulate economic development and industry growth, boost state and national investments in campus research and facilities and enhance the recruitment and retention of outstanding and successful faculty and students. Top-tier research universities are often linked with the economic success of rapidly growing metropolitan areas and strong evidence demonstrates that research universities serve to catalyze and sustain dynamic growth by ensuring a healthy supply of highly skilled workers; advancing industry development; attracting and spawning high-tech, innovative companies; and enabling successful industry-university research collaborations and partnerships.<sup>1</sup>

To achieve this goal, UNC Charlotte must develop a long-term strategy for investment and growth that builds upon the University's unique strengths and assets and targets all aspects of the research enterprise, including the diversity of funding sponsors, the size of its research faculty and staff, and the strength and size of its graduate programs. Key to effectively identifying strategies and tactics for accelerating research to top-tier status is to look to research institutions comparable to UNC Charlotte that have achieved this position and learn from their success.

## Top-Tier Research Commission Membership and Charge

UNC Charlotte Chancellor Sharon L. Gaber launched a campuswide strategic planning effort in fall 2020 and established the Top-Tier Research Commission to examine the University's potential to achieve top-tier research status. The Commission, chaired by Vice Chancellor for

## Top-Tier Research Commission Participants

### Chair

- **Rick Tankersley**, vice chancellor for Research and Economic Development

### Members

- **Kirill Afonin**, professor of chemistry (College of Liberal Arts & Sciences)
- **David Bellar**, chair of kinesiology (College of Health and Human Services)
- **Cheryl Brown**, chair of political science and public administration (College of Liberal Arts & Sciences)
- **Blaine Brownell**, director, School of Architecture (College of Arts + Architecture)
- **Valerie Crickard**, executive director of grants and contracts administration (Research and Economic Development)
- **John Daniels**, chair of civil and environmental engineering (The William States Lee College of Engineering)
- **Nancy Gutierrez**, dean, College of Liberal Arts & Sciences
- **Scott Kissau**, associate dean of research and graduate education (Cato College of Education)
- **Richard Lambert**, professor of educational leadership (Cato College of Education)
- **Heather Lipford**, interim associate dean for research (College of Computing and Informatics)
- **Mike Mazzola**, director of EPIC (The William States Lee College of Engineering)
- **Valerie Mazzotti**, professor of special education and child development (Cato College of Education)
- **Fatma Mili**, dean, College of Computing and Informatics
- **Brigid Mullany**, associate dean for research and graduate education, (The William States Lee College of Engineering)
- **Elizabeth Racine**, professor of public health sciences (College of Health and Human Services)
- **Lisa Rasmussen**, professor of philosophy (College of Liberal Arts & Sciences)
- **Adam Reitzel**, professor of biological sciences (College of Liberal Arts & Sciences)
- **Samira Shaikh**, assistant professor of computer science (College of Computing and Informatics)
- **Elizabeth Siler**, interim associate dean for collection services, Atkins Library (Academic Affairs)
- **Elizabeth Stearns**, professor of sociology (College of Liberal Arts & Sciences)
- **Peter Szanton**, director, Office of Research (College of Liberal Arts & Sciences)
- **Brett Tempest**, associate professor of civil and environmental engineering (The William States Lee College of Engineering)
- **Lori Thomas**, director of research and faculty engagement (Urban Institute)
- **Byron White**, associate provost, Urban Research and Community Engagement Office
- **Dongsong Zhang**, Belk Endowed Chair of Business Information Systems and Operations Management (Belk College of Business)

### Staff

- **Jerry Coughter**, executive director, The Dubois Center at UNC Charlotte Center City
- **Joy McAuley**, proposal specialist, Center for Research Excellence, Research and Economic Development

<sup>1</sup> See Muro, M and W. A. Galston, 2018. Countering the geography of discontent: Strategies for left-behind places. (Washington: Brookings Institution) and Shambaugh, J. and R. Nunn. 2018. Place-based policies for shared economic growth (Washington: The Hamilton Project).

Research and Economic Development Rick Tankersley, included 25 faculty members and administrators.

The Commission convened in December 2020 and met periodically throughout spring and summer 2021. Chancellor Gaber’s charge to the Commission included two tasks:

1. Evaluate UNC Charlotte’s current portfolio of research, scholarship and creative and performing arts activities, and identify core areas of excellence and distinction that represent existing and emerging institutional strengths.
2. Conduct a comprehensive gap analysis to determine where UNC Charlotte lags in its pursuit of top-tier status and develop a set of actionable recommendations and associated strategies to boost research activity and productivity and inform the University’s new strategic plan.

Two subcommittees were formed to complete these tasks. Each provided periodic updates to the full Commission and all members were able to review and approve the outcomes, findings and recommendations detailed in this report.

It is important to note the Commission was not asked to evaluate the feasibility of achieving top-tier status or to prioritize recommendations, strategies and tactics associated with the roadmap. Estimating the resources, including staffing and funding, needed to fully implement the recommendations was beyond the scope of the Commission’s charge.

## Task 1: Identification of Areas of Research Focus and Distinction

To accomplish the first task — determine core areas of research focus and distinction that represent existing and emerging institutional strengths — the Commission enlisted the campus community to help identify clusters of scholarly research and creativity where collaborative networks of UNC Charlotte faculty currently excel or are poised to take a leadership position nationally and internationally.

Recognizing the diversity of research activity at the University and that high-impact knowledge and research may come from any disciplinary field, including those typically not associated with sponsored research funding, the Commission adopted a “bottom-up” approach that invited input from self-selecting, self-organizing teams of faculty. A campuswide “call for nominations” was issued to solicit submissions from diverse teams of faculty and staff that included both established leaders and rising stars. Of particular interest were submissions that targeted (1) broad, thematic areas where the University already has achieved a national level of distinction, and (2) areas where continued work, future investments and new resources could significantly advance UNC Charlotte’s research reputation, raise the profile of its scholarly programs and accelerate research productivity and extramural expenditures. The Commission also was interested in using this process to identify collaborations at the intersections of existing areas of strength that often transcend traditional departmental or disciplinary boundaries and tackle some of society’s most complex, urgent and vexing challenges. Submitters were encouraged to consult with their college leadership to help identify others from outside their department with related expertise that could make meaningful contributions to potential areas.

### A. FINAL AREAS OF RESEARCH FOCUS AND DISTINCTION

Details of the two-phase process used by the Commission to evaluate the nominations are outlined in Appendix A. The final slate included 17 areas distributed among four categories updated from an original three (Figure 1). During its deliberations, the Commission decided to split the category of Existing and Emerging Excellence into two — Existing Excellence and Emerging Impact —to differentiate between established, signature research programs with strong international reputations and prominence and areas with significant potential to



Figure 1: Final slate of areas of research focus and distinction.

grow and achieve a comparable level of distinction in the near future. Areas in the latter category are supported by teams of highly productive interdisciplinary faculty and staff with a growing track record of impactful research and scholarship and extramural funding success.

Below are brief descriptions of each area. While the descriptions were informed by the original submissions, commission members felt strongly that the final areas should be viewed as broad, flexible and invitational, and not be restricted or bound by the descriptions and participants listed in the original submissions.

It is anticipated that these areas will contribute to the ongoing campuswide strategic planning effort and will be the targets of many of the tactics and interventions for accelerating research described on page 9 of this report. They also will serve as foci for strategic institutional investments and future research development support, including new tenure-track and research faculty hires, endowed professorships, graduate programs, core facilities, large-scale proposal development and planning, seed grant funding, honorific awards and recognitions, targeted proposals, and equipment and infrastructure investments. Therefore, all campus faculty and staff are encouraged to identify ways their research, scholarship and creative activities might contribute to the growth and success of one or more of the areas and to participate in networking opportunities and activities designed to bolster awareness of researchers working on related topics and catalyze and strengthen new and existing collaborative research clusters.

## 1. Areas of Existing Excellence

### a) Advanced Manufacturing and Metrology

Advanced manufacturing enables the realization of the next generation of products to meet future energy, health care, security and transport needs. The introduction of new, innovative processes — such as additive manufacturing — and the evolution of existing processes — such as high-precision machining — rely on dimensional metrology (measurements) to quantify and evaluate the process output. UNC Charlotte's unique integrated manufacturing and metrology capabilities are used to first assess the limitations of current manufacturing technologies and then identify alternative, more efficient and improved approaches. Through university-industry collaborative centers, like the Center for Precision Metrology and the Center for Freeform Optics, teams of faculty tackle diverse topics ranging from measuring millimeter-scale cooling channels on turbine blades, to evaluating meter-scale gears for wind turbines, to polishing optics with nanometer form errors, to machining lightweight components for aircraft, to manufacturing and testing novel ceramic materials for biomedical applications.

### b) Computational Life Sciences and Health Bioinformatics

Using advanced computational and informatics tools, UNC Charlotte researchers from diverse fields collaborate to prevent and combat threats to human health, reduce health disparities and increase ecosystem vitality. Their approach uses computational biology as a centerpiece and recognizes the interdependence among human health, the health of other living species and the environment. UNC Charlotte researchers investigate the underlying processes that drive emergent diseases and define host-microbe interactions, which are central to understanding problems and developing novel solutions. Emerging threats to human health, such as highly transmissible viruses, and durable problems, including antibiotic resistance and food safety, demand comprehensive and innovative approaches. Particularly through the Bioinformatics Research Center, University researchers apply advanced expertise and knowledge in epidemiology, ecology, bioinformatics, public health, mathematics, computing, geography, engineering and education to study these complex problems, with a focus on building resilience against threats and guiding practices that increase human and ecosystem health.

### c) Cybersecurity

Long before the term “cybersecurity” entered the American lexicon, UNC Charlotte was a leader in the field of information security. Established 22 years ago, the University's program was the first in North Carolina to be recognized by the National Security Agency (NSA) as a Center of Academic Excellence in Cyber Research. The impact of UNC Charlotte's cybersecurity research has grown in lockstep with the demand for greater protections in an increasingly digital world. In a dangerous era of identity theft and international cybercrime, UNC Charlotte's cybersecurity research fuels innovation to understand and mitigate threats to our systems, information and lives, especially those related to the confidentiality, integrity and availability of digital information. Research in hardware and infrastructure security, privacy and digital citizenship, and security analytics and automation address the secure, private and trustworthy operation of infrastructure in domains such as data and social sciences, energy and manufacturing.

#### d) Migration and Diaspora Studies

Migration and diaspora studies at UNC Charlotte take a holistic, multidisciplinary approach to examining a fundamental human experience: the movement from one homeland to another. More people than ever have left their native countries, driven by economics, political violence, social dynamics and climate change. Studies of these migrants, their hosts and the communities they leave behind are complex, transcend traditional disciplinary boundaries, and address urgent and current topics, such as immigration policy and governance; race and ethnicity in cultural and artistic expression, violence and conflict; and equity and justice in health, education, environmental sustainability and socioeconomic mobility. With a particular focus on African, Caribbean and Latin American diasporas, UNC Charlotte faculty and students strive to understand the shared heritage and experience of these scattered populations and the many legacies of displacement and dispersion.

#### e) Optics and Optoelectronics

UNC Charlotte's advanced expertise in optics, the science of light, and optoelectronics, the study and development of electronic devices to detect and control light, address critical needs in the areas of national competitiveness and security. Enhanced by the founding more than 20 years ago of the Center for Optoelectronics and Optical Communications, optics is a longtime signature strength for UNC Charlotte. Collaborative teams study and develop electronic devices to detect and control light and to create innovative applications and novel materials for medicine, defense, energy, infrastructure, communications, virtual reality and other fields. Central to the research are strategic investments in advanced technologies and equipment and the creation of collaborative centers that spur intensive use-inspired research with industry and government partners, particularly the Center for Freeform Optics, the Center for Metamaterials and the Center for Precision Metrology. Collectively, University researchers capitalize upon historic strengths in optics and microelectronics, while pushing forward into new and potentially revolutionary research directions, such as the development of novel materials.

#### f) Transformational Energy

Transitioning the domestic and global energy economies to low- or net-zero carbon emissions will have critical impacts in meeting society's energy needs while promoting a healthy climate. A pioneer and leader in energy research and education, UNC Charlotte makes significant multidisciplinary contributions to the field through six areas: scientific discovery and technology development, fast-paced applied research, technology integration through multi-institutional projects, technical and laboratory services, workforce development and public/private partnerships. Led by the UNC Charlotte Energy Production and Infrastructure Center (EPIC), the University's transformational energy research engages local, regional, state and federal agencies with key business and industry stakeholders to further accelerate the country's transition to clean energy.

## 2. Areas of Emerging Impact

#### a) Smart and Sustainable Cities

As the world continues to urbanize, cities must address the impacts of growth on infrastructure, the environment and public health. With nearly 70% of the world's population projected to live in cities by 2050, UNC Charlotte research that contributes to strategic, sustainable growth and safe, healthy urban environments is crucial. Teams of University researchers tackle the challenges of an urbanizing world in diverse ways. Some harness vast amounts of data or advances in artificial intelligence to guide sustainable urbanization or address complex challenges in public safety and transportation, while others create cost-effective technologies that reduce building energy use and produce clean power. The University's multidisciplinary teams include engineers, architects, inventors and experts in transportation, public safety, land use, urban design, city management and housing. Existing campus assets include extensive experience in urban data curation, expertise in geanalytics and collaborative partnerships with local and regional community-based organizations, agencies and industries.

#### b) Socioeconomic Mobility

Income disparities and lack of socioeconomic mobility profoundly shape access to health care, education, housing, employment and other key aspects of life and well-being. UNC Charlotte researchers from psychology, sociology, social work, public policy, public health, geography and anthropology study the complex factors that affect children's and families' prospects for upward mobility. Factors such as education opportunities, financial stability and health care access often intersect to facilitate or hinder socioeconomic mobility. University researchers partner with external organizations and agencies to identify these factors and to

map policy and systems approaches intended to facilitate socioeconomic mobility. Data-driven expertise partnered with community expertise results in a shared commitment to address problems such as early childcare and education, college and career readiness, child and family stability and inequities. In one targeted approach, the Social Aspects of Health Initiative focuses on social, institutional and environmental contexts to identify and address health inequities in urban regions.

c) **Transportation and Advanced Mobility**

Transportation and mobility issues are among the most critical to social mobility, and related infrastructure can represent expensive public and private assets. As vehicles continue to evolve into autonomous, smart and connected machines, UNC Charlotte faculty are harnessing sensors, data analytics, artificial intelligence and predictive modeling to transform mobility systems for people, materials and products. The University's interdisciplinary teams are generating innovative ways to improve, operate and maintain critical physical infrastructure, while addressing societal needs, optimizing the use of constrained resources, and maintaining safety and privacy. Existing expertise includes data analytics in transportation, airport/aviation infrastructure and materials research; smart and efficient multimodal transportation systems; connected and autonomous vehicles (CAVs); transportation operations; and technology readiness and security. Life-cycle management experts use advanced techniques to assess impacts on economies, regional connectivity, workforce development and land use.

d) **Urban Health**

Research suggests that ZIP code is a greater determinant of health than genetic code. UNC Charlotte experts work in North Carolina's largest city and beyond on the social determinants of health to solve real-world challenges. With populations expanding rapidly in metropolitan areas, University researchers study how urban environments affect the health of residents. Issues unique to urban communities, such as traffic patterns, school districting, affordable housing, wage policies, pollution and access to healthy food, are among the many underlying causes of health inequities. Interdisciplinary teams from public health, data science, biostatistics, psychology, anthropology and social work use a variety of research methods, including action research, community-based participatory research and clinical research, to identify practical health promotion solutions, implement community-based chronic disease prevention and management programs, advance health policy reform, promote racial equity, improve health outcomes and minimize health disparities.

### **3. Areas of Unique Distinction**

a) **Educational Measurement and Evaluation**

Data drives positive change, and UNC Charlotte's Center for Educational Measurement and Evaluation (CEME) provides the evaluation and measurement expertise for meaningful analysis of preK-12 teachers and students nationwide to ensure student success. University researchers work with community partners to better serve learners and offer expertise in the social sciences and STEM fields and in early childhood and special education. CEME directs novel studies examining the reliability, cultural sensitivity and fairness of ratings given to North Carolina teachers by their principals and evaluators. Extensive development and validation research is conducted on Teaching Strategies GOLD, an annual publication used to assess more than two million children nationally as well as validation and implementation fidelity research on the N.C. Kindergarten Entry Assessment measure used by more than 5,000 teachers each year to assess all incoming kindergarten children.

b) **Inclusive Leadership and Diversity**

UNC Charlotte researchers are using cutting-edge data science alongside conventional approaches to redefine leadership, with an interdisciplinary focus on the emerging area of leadership diversity and inclusion. For more than 50 years, UNC Charlotte has developed business leaders through nationally ranked graduate programs for working professionals and corporate leaders. Supported by federal agencies and corporations, collaborative teams of faculty seek to help redefine leadership and develop effective human resource management and team development practices and policies. Using science-based solutions, these initiatives address many of the biggest issues facing global and regional organizations, including reducing and eliminating the barriers experienced by women and people of color as they rise to and hold leadership positions.

c) **Special and Exceptional Education**

UNC Charlotte's special education experts develop and implement evidence-based approaches and practices that support the establishment of K-12 classroom environments in which every learner can thrive. Using practices that engage a range of

community partners in mutually beneficial approaches and match regional and national economic, civic and cultural priorities, University researchers develop innovative programs that translate research into practice and provide students with disabilities access to services that offer opportunities for positive life outcomes after graduation. Establishing conditions and environments that meet the needs of all learners and foster a culture of inclusivity for students with disabilities is a priority, with a particular emphasis on educating students with extensive support needs and helping students transition effectively into adult life. The success of these efforts is exemplified by the largest grant in UNC Charlotte's history, an award of more than \$20 million from the U.S. Department of Education, to support the University-led National Technical Assistance Center on Transition: The Collaborative.

#### 4. Areas of Future Opportunity

##### a) Artificial Intelligence

Artificial intelligence (AI) enables machines to perform difficult tasks, interface and collaborate with humans and augment human capabilities. AI impacts almost every area of our lives, from finance to medicine to consumer electronics, and the associated innovations are expected to transform how the world does business, translating into a global market that exceeds \$700 billion by 2027. UNC Charlotte faculty expertise touches on a range of emerging AI-focus areas, including machine learning and data mining methods; robotics and autonomous systems; human-assistive AI; high-performance AI; and ethical, explainable and trustworthy AI. University researchers develop foundational techniques and apply them to address problems across a broad range of interests, including computing infrastructure and cybersecurity, energy, climate change, health care, scientific discovery, smart cities, personalized education and defense. The work is advanced through a network of collaborative national partnerships with private industry and government agencies.

##### b) Climate Change and Resilience

Understanding, communicating, and addressing the complex consequences of climate change requires a concerted, integrated effort by teams of faculty researchers with diverse perspectives, tools and methodologies. At UNC Charlotte, researchers from fields ranging from geology to genetics, to arts and architecture, employ comprehensive, multidisciplinary approaches to study past, ongoing and future impacts of climate and pursue innovative solutions for mitigation, adaptation and resilience. University researchers study how climate change affects natural systems and phenomena, such as paleo-climate and -fires, rock landslides, water chemistry and microbial genomics, and storms and atmospheric heating. They also study and communicate — through arts, humanities and community engagement — climate change interactions with human systems, including natural hazard impacts, food supply robustness and fragility, energy and transportation, and socio-spatial economic and health disparities. Bridging the natural, social and behavioral sciences, engineering, arts, humanities and policy studies, these collaborations and research thrusts have gained local and national attention and inform the work of policymakers and practitioners charged with advancing and implementing mitigation and adaptation strategies and solutions.

##### c) Nanoscale Science and Materials

Science and engineering conducted at the nanoscale — a scale that is 100,000 times smaller than the width of a human hair — is driving a revolution in the creation of new solutions to worldwide problems, particularly in energy, health and medicine and the environment. UNC Charlotte nanoscale researchers work toward the development of novel materials, devices and structures to address these problems and challenges. University researchers are developing RNA nanoparticles for immunotherapies and vaccines that target antibiotic-resistant pathogens and cancers, and developing nanosensors for the clinical diagnosis of COVID-19. They investigate novel organic molecular dyes and polymers for use in solar energy conversion, generate inorganic nanomaterials to build efficient energy storage devices and develop sustainable methods to decontaminate water. Others on campus are applying a variety of interdisciplinary experimental approaches to gain molecular-level insights into biological systems, with significance for cancer research, immune responses, neurodegenerative diseases and other important areas of research.

##### d) Online Misinformation and Deception

Online misinformation, disinformation and deception spread by humans or bots are designed to mislead users, organizations and societies, serving to promote dangerous, socially destabilizing ideas through fake news, conspiracy theories, rumors, fake consumer reviews and spam blogs. UNC Charlotte researchers from multiple disciplines investigate online deception; build systems that automatically identify, weed out and minimize the ways these schemes and systems spread lies online; and analyze how misinformation and online deception compromise the ability of individuals to make informed decisions. To restore confidence



in the online information environment and promote trusted, fact-based information sources, University faculty use novel tools and design and develop innovative, interactive visual interfaces that enable the automatic detection of misinformation, facilitate the systematic investigation of misinformation sources and prevent the propagation and dissemination of fake news.

## Task 2: Identification of Strategies and Tactics for Accelerating Research

The path to becoming a top-tier research institution includes seeking information from and about universities like UNC Charlotte that have successfully done so, developing a detailed roadmap of strategies and tactics to boost research activity and productivity, and using a suite of success metrics for tracking progress toward our goal. This informed decision making is essential to strategic planning and the efficient and responsible allocation of valuable resources necessary for achieving top-tier status.

### A. SELECTION OF PEER AND ASPIRATIONAL INSTITUTIONS

#### 1. Peer Institutions

Part of the Commission's charge was to develop a list of peer research universities with similar qualities, characteristics and challenges that could be used as the basis for comparison and benchmarking. When possible, the Commission took a data-informed approach to generating a short-list of institutions and relied on publicly available data, including information from the annual NSF Higher Education Research and Development (HERD) survey<sup>2</sup>, to make comparisons. The selection process was iterative and involved using cluster analysis to identify institutions that fit a list of desired characteristics and qualities, including:

- Similar size and type [i.e., large (30,000+ enrollment), public institution]
- Similar ratio of undergraduate to graduate enrollment
- Urban setting/location
- Comparable student demographics
- Similar budget and resources (endowment, state funding allocation)
- Similar position within a state university system
- Similar research expenditures and doctoral-research/scholarship programs
- No medical school affiliation
- Similar mission
- Focus on community-engaged research, including Carnegie Community Engagement Elective Classification<sup>3</sup>

Nine peer institutions selected by the Commission are:

Florida Atlantic University <sup>¥</sup>	San Diego State University <sup>¥</sup>
Indiana University-Purdue University <sup>¥</sup>	University of Denver
Northern Arizona University <sup>¥</sup>	University of Memphis
Portland State University <sup>¥</sup>	University of Texas San Antonio <sup>¥</sup>
Rutgers University-Newark	

Six of the nine institutions (indicated above by a "¥") are members of the set of peer institutions identified by the UNC System in its 2020 Peer Study.<sup>4</sup>

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<sup>2</sup> Higher Education Research and Development (HERD) Survey, Retrieved (May 2021) from <https://www.nsf.gov/statistics/srvyherd/>

<sup>3</sup> An elective classification provided by the Carnegie Foundation for the Advancement of Teaching identifying institutions that have made commitments to public purpose, to deepen the practice of service and to further strengthen bonds between campus and community as evidenced in their institutional culture and mission and their curricular and co-curricular programming. See: <https://public-purpose.org/initiatives/carnegie-elective-classifications/>

<sup>4</sup> The University of North Carolina System 2020 Peer Study (Nov 2020). Retrieved (January 2021) from <https://www.northcarolina.edu/wp-content/uploads/reports-and-documents/academic-affairs/unc-system-peer-study-2020.pdf>

## 2. Aspirational Institutions

The Commission took a similar approach to selecting aspirational institutions that have achieved top-tier status while operating under conditions and constraints similar to UNC Charlotte. In addition to the listed qualities for peer institutions, other desirable characteristics for aspirational institutions included:

- Focus on interdisciplinary programs and research
- Recent successful pursuit of top-tier status
- Research expenditures less than 3x the current expenditures of UNC Charlotte
- Similar sources of federal funding
- Similar funding profile by discipline (e.g., natural and physical sciences, engineering, humanities)
- Similar funding profile by extramural source/sponsor.
- Comparable doctoral programs (by discipline)
- Significant (>100%) growth in research expenditures over the past five years

The final group of 11 aspirational institutions identified are:

Florida International University	University of Houston <sup>¥</sup>
George Mason University <sup>¥</sup>	University of Nevada-Las Vegas <sup>¥</sup>
Georgia State University	University of North Texas
SUNY Albany	University of Texas at El Paso
Syracuse University	University of Wisconsin-Milwaukee
University of Colorado Denver	

Three of the 11 institutions (“¥”) are members of the set of UNC Charlotte peer institutions identified in the 2020 UNC System Peer Study <sup>4</sup>. The University of Texas at El Paso, University of Colorado Denver and University of Nevada-Las Vegas achieved top-tier status within the past 5 years. Two institutions, Syracuse University and University of Nevada-Las Vegas, were singled out as “shooting stars” for recording gains in research expenditures over the past five years that exceeded 100%.

### B. INTERVIEWS WITH ASPIRATIONAL INSTITUTION REPRESENTATIVES

To assemble a list of recommendations, strategies and tactics for accelerating research productivity, especially those that contribute to achieving and sustaining top-tier status, subcommittee members conducted 11 hour-long semi-structured interviews with 20 administrators and faculty from nine of the 11 Aspirational Institutions (Appendix B). Most interviewees were chief research officers (e.g., vice presidents, vice provosts and associate vice presidents for research) or administrators responsible for research development and sponsored program management and administration. All interviews were recorded, transcribed and made available to all Commission members for review.

### C. RECOMMENDATIONS FOR ACCELERATING RESEARCH AND ACHIEVING TOP-TIER STATUS

The following recommendations were compiled by Commission members and designed to address the findings of the gap analysis, especially the need to significantly increase research expenditures, doctoral conferrals and the number of S&E postdoc/research staff. Associated with each recommendation are several potential strategies and tactics that highlight policies, practices and interventions known to promote collaboration and support the growth and management of the research enterprise. Footnotes are used to identify successful practices and approaches that were sourced from interviews with the representatives of the Aspirational Institutions. The Commission also assembled a list of potential research metrics that can be used to monitor progress toward top-tier status and to assess the impact of specific strategies and interventions (Appendix C).

#### 1. Acceleration of Research Growth toward National and International Prominence

- a) **Recommendation:** Establish a campuswide culture of grant seeking that supports and motivates faculty to participate in the research enterprise, especially sponsored research, and values the contributions of all fields and disciplines.

## Strategies and Tactics

- i) **Establish Grant Seeking Success as an Expected Outcome:** Currently, 40% of UNC Charlotte's tenured and tenure-track faculty participate as PI, co-PI or senior personnel in externally funded projects. Growing research expenditures, especially per capita STEM and non-STEM expenditures, will require increasing faculty participation to at least 60%.<sup>5</sup> One way to meet this goal is to re-engage faculty currently not active in funded research and identify ways they can meaningfully contribute to existing or emerging research thrusts or projects. Their sustained involvement will require regular, clear communication of this expectation during faculty recruitment and pre- and post-tenure performance evaluations.

While the expectation to seek and secure external funding to support research, fellowships and creative scholarship has increased, tenure and promotion criteria vary by academic unit, and this expectation may not be universally held or reflected in the published criteria. Departments and colleges should conduct a comprehensive review of tenure and promotion criteria to ensure the guidelines appropriately reflect grant seeking and research funding expectations of the department, college and University, and they should encourage and reward faculty who participate in disciplinary, multidisciplinary and interdisciplinary research.<sup>6</sup> Similarly, workload policies should support a campus grant seeking culture and enable research-intensive faculty to adjust their relative commitments to research, teaching and service.

- ii) **Expand Internal (Institutional) Research Funding Opportunities:** Seed grant funding can provide investigators with support to collect preliminary data, conduct exploratory research and establish collaborations for competitive extramural grant applications.

The current campuswide Faculty Research Grant and Ignite Planning Grant programs should be significantly expanded to include new opportunities intended to: (i) support new and novel collaborations among small, multidisciplinary teams that involve experts from diverse scientific, engineering, humanities, social sciences and creative art domains, (ii) promote the development of competitive center-scale proposals in priority research areas, (iii) support and foster collaborations with international partners and research groups, and (iv) encourage the revision and resubmission of unfunded grant proposals that receive favorable reviews.<sup>7</sup>

Colleges also should prioritize the development and expansion of similar programs that support collaborations among faculty focused on college-level areas of priority. Consideration should be given to restructuring the distribution of Facilities and Administration (F&A) funds to provide additional funds to campus units, including centers and colleges, to be applied to these programs. In all cases, seed grant proposals should be evaluated based on their potential for leveraging extramural funding and include an expected outcome of submission of at least one external research or fellowship proposal based on the results of the pilot project or planning grant.<sup>8</sup>

- iii) **Enhance and Expand Training for Grant Seeking:** Grant writing differs from academic writing; even faculty who regularly publish scholarly works and research outcomes may lack the skills and competencies to develop competitive proposals. To advance grant seeking skills of faculty, the Center of Research Excellence should expand professional development and training programs (e.g., the Catalyst Boot Camp programs) designed to help faculty establish long-term research agendas and successfully apply for research grants from state and federal agencies, foundations and nonprofit organizations. Tailored to the needs of faculty from a range of disciplines, these programs should enhance the research capacity of the University and institutionalize support for the advancement and success of early- and mid-career faculty by (i) providing comprehensive training in the preparation of competitive grant proposals, (ii) establishing a research mentoring program, and (iii) creating a community of practice to facilitate and engage diverse groups of faculty in disciplinary and interdisciplinary research.<sup>9</sup>

Building on current programs designed for STEM fields, the social sciences, arts and humanities, new Catalyst offerings should focus on specific funding mechanisms and programs that align with research focus areas and interests of faculty (e.g., federal SBIR/STTR proposals, National Science Foundation CAREER program, Institute for Education Sciences research

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<sup>5</sup> Georgia State University (GSU) requires tenured and tenure-track faculty to allocate a minimum of 40% of effort toward research.

<sup>6</sup> GSU encouraged departments to modify promotion and tenure to value collaborative research.

<sup>7</sup> Syracuse offers seed grants ("Cuse Grants") that provide up to \$30K in seed funding.

<sup>8</sup> George Mason University provided \$25 -50K seed grants to develop proposals for institutional, multidisciplinary center grants of \$250K in identified priority areas.

<sup>9</sup> A University of North Texas (UNT) program provides NSF CAREER program workshops to train faculty to tell their stories.

programs, graduate traineeship and fellowship programs, undergraduate research programs and major instrumentation grants).<sup>10</sup> Training programs that result in even modest gains in non-STEM funding could have a significant impact on the University's relative position among peer and aspirational institutions.<sup>11</sup> Moreover, promoting interdisciplinary research aimed at a growing regional demand for social impact solutions provides opportunities to increase such expenditures.

- iv) **Adopt Tools and Practices that Promote Collaboration:** To pursue impactful solutions to complex research questions and societal issues, the University must assemble expert teams of diverse faculty across disciplines and domains. Accomplishing this objective requires a comprehensive understanding of available expertise, on campus and at other institutions. Searchable databases, such as Academic Analytics' Faculty Insight and External Discovery Site, should be adopted and promoted to help identify potential collaborators, locate others with complementary expertise and match research interests with potential funding opportunities.<sup>12</sup>

The Office of Research and Economic Development should collaborate with deans and campus units to launch initiatives and evidence-based practices known to promote both intra- and interinstitutional collaborations, including establishing: (i) faculty development programs that foster learning and skill development in team science skills to perform cross-disciplinary and transdisciplinary research, (ii) seminar and speaker series on areas of existing or emerging research excellence, (iii) research collaboration travel grants that enable faculty to visit or host scholars at other institutions with the goal of initiating productive collaborations of mutual interest, (iv) short-term, collaborative spaces for teams to conduct "design sprints" focused on specific research projects or funding opportunities and (v) graduate research assistantships for students to initiate or advance joint research projects of mutual interest between two or more campus research groups.

- v) **Support International Collaborative Research and Exchange Programs:** As research becomes increasingly global, UNC Charlotte should work to raise its international reputation and visibility through initiatives that support faculty who engage in innovative research and scholarship with foreign researchers and international partners. The Office of Research and Economic Development should work with the Office of International Programs to provide institutional support for teams of faculty to establish collaborative relationships and research partnerships that enable access to foreign researchers and facilities, support the reciprocal exchange of faculty and student researchers (in-person and virtually) and establish formal joint research projects with institutions and centers with complementary expertise. Both offices should develop programs that strengthen training in internationalization and encourage the submission of proposals to federal programs that support international research and education (e.g., the Fulbright program, Department of Education Foreign Language and Area Studies Fellowship Program and NSF Partnerships for International Research and Education program).<sup>13</sup>
- vi) **Adopt Award Reporting Practices that Recognize Collaborative Research:** Current reporting of sponsored research ties new awards and research expenditures to the lead PI, a practice that often fails to accurately acknowledge the critical contributions of participating researchers from other disciplines and academic units. To fully recognize collaborative and interdisciplinary research that spans fields and domains, the University should adopt a reporting format and structure that allocates awards and expenditures to faculty and their home academic units according to the relative contribution to a project.<sup>14</sup>
- vii) **Build a Culture that Encourages and Supports Entrepreneurship and Innovative, Use-Inspired Research:** To expand faculty engagement in entrepreneurship, translational research and the licensing and commercialization of their technologies, the University should adopt an aggressive growth strategy that (i) supports and encourages faculty and student participation in Ventureprise programs, (ii) provides training in disclosures, patents and commercialization (iii) establishes a campus climate and innovation ecosystem that promotes new venture creation, incubation and acceleration and (iv) establishes the commercialization of technologies and the management and promotion of University intellectual property (IP) as a strategic priority.

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<sup>10</sup> University at Albany provides training to assistant professors interested in applying for CAREER and other federal programs aimed at early-career faculty.

<sup>11</sup> University of Wisconsin-Milwaukee (UWM) created a seed grant program with smaller awards specifically targeted for faculty in the humanities.

<sup>12</sup> The University of Texas at El Paso's (UTEP)'s custom Expertise Connector system collects and compares faculty data (using keywords in grant proposals to provide faculty members with an updated listing of funding opportunities specific to their area of research. This system helps identify naturally occurring clusters.

<sup>13</sup> Florida International University (FIU) established a research foundation under the President's Office to oversee international projects.

<sup>14</sup> UTEP, for example, returns indirect costs to PIs and co-PIs according to the percent effort assigned in the grant proposal.

- viii) **Seek and Support Appointments for Faculty on Statewide Boards and Councils:** Local and statewide boards, councils and commissions provide faculty and administrators opportunities to engage in public service, build relationships with key stakeholders and government officials and raise awareness of University expertise and talent. Constituent Relations and the offices of Academic Affairs and Research and Economic Development should collaborate to identify qualified faculty and assist them in seeking appointments.
- b) **Recommendation:** Develop a comprehensive strategy to triple over the next five to seven years the number of full-time, nontenure-track research faculty and postdoctoral trainees conducting sponsored research.

### Strategies and Tactics

- i) **Establish a University-Sponsored Postdoctoral Scholar Program:** Increasing the number of postdoctoral trainees participating in research will enhance the overall productivity of faculty researchers and serve to drive research across the campus. Positions available through this program should contribute to the University's investment in research and connect with an identified priority research area or one poised for significant growth. In addition, they should be extended to faculty mentors with track records of external research funding and effective mentorship. Cost-sharing the salary (e.g., 50/50 split) or securing follow-on funding to support a postdoc beyond the initial two- or three-year appointment or to support additional postdoctoral researchers should be expected of the postdoc mentor.<sup>15</sup> The program should be coupled with the campus's commitment to building a diverse and inclusive research community and attracting more faculty and researchers from underrepresented groups by helping to recruit and develop scholars for possible tenure-track appointments at UNC Charlotte.
- ii) **Develop a Supportive Culture and Climate for Postdoctoral Researchers:** A postdoctoral experience should include training and mentoring for individuals to succeed as independent professionals and researchers. In addition to expanding research skills, postdoctoral researchers should gain experience supervising and mentoring students and trainees, seeking grants and writing proposals, managing labs and other transferable skills for a range of careers.<sup>16</sup> With an anticipated increased number of postdoctoral researchers across campus, the Office of Research and Economic Development should establish a new unit to foster a positive, nurturing and inclusive environment for postdocs and other nonfaculty researchers, promote communication, facilitate networking and career development and coordinate opportunities for skill and professional development.
- iii) **Support Hiring of Nontenure-Track, Research-Dedicated Faculty in Priority Areas:** Unlike their tenure-track counterparts, research faculty and staff can concentrate on advancing new initiatives, supporting the work of centers, attracting grant funding and conducting their own externally funded projects. In addition, they can help establish and sustain collaborations with faculty from across the institution and support community- and industry-engaged research.<sup>17</sup> UNC Charlotte should establish new research professorships in select priority areas that span multiple disciplines or departments. These professors should: (i) have their own career progression track (e.g., assistant, associate, full), (ii) contribute to larger collaborative teams and University research centers and (iii) be expected to secure external funding to cover a significant portion of their salary and research expenses. Bridge funding should be available to successful nontenure-track researchers during short-term gaps in external funding.
- c) **Recommendation:** Adopt strategies to increase the diversity, size and complexity of research awards and expand the University's research portfolio, including seeking support from a wider range of potential government, industry, nonprofit and private sponsors.

### Strategies and Tactics

- i) **Expand Support for Complex, Interdisciplinary Proposal Development and Award Management:** Large-scale, interdisciplinary and center-level projects often allow faculty to engage in new or emerging areas of research that can disproportionately impact their fields or disciplines. Typically involving multiple departments, disciplines and colleges, these grant proposals require significant time and resources to (i) establish and build relationships among participating partners, (ii) identify and cultivate appropriate collaborators and (iii) draft and assemble submissions. The University should expand CLIPP (Complex, Large

<sup>15</sup> The Research Office at FIU collaborates with academic affairs to provide 50% of the cost of postdocs.

<sup>16</sup> FIU instituted a policy that allows postdocs to serve as PIs on grant proposals, thereby providing additional training to the postdoctoral fellow.

<sup>17</sup> GSU attributes a part of the success of their university research centers to having established non-tenure-track scientist positions within its hiring process.

Interdisciplinary Proposal Program) services and capacity to support the development of large, interdisciplinary proposals by collaborative teams of faculty. Support should focus on organizing and convening meetings of potential stakeholders, developing and reviewing proposal descriptions and supporting documents and facilitating and securing documentation of institutional support. Complementary support services should be developed for overseeing and coordinating the post-award management and administration of successful proposals.

- ii) **Train and Support Faculty to Seek Support from a Broader Range of Funding Sources:** Most of UNC Charlotte's external research support comes from traditional federal funding sources, such as the NSF, that focus on basic or curiosity-driven research. To diversify its research portfolio, the University must prepare faculty to seek support from mission-driven agencies (e.g., U.S. Department of Defense) that focus on applied and use-inspired research.<sup>18</sup> Support should include hosting campus visits by program officers and representatives from national laboratories, developing training curricula for faculty interested in applying to mission-driven agencies and establishing a mentorship program modeled after Catalyst that connects early-career faculty with more senior researchers who have a track record of funding from mission agencies. The University should actively encourage faculty to seek temporary appointments as program directors and administrators at federal funding agencies, including NSF, NIH, DARPA, NASA and others.
- d) **Recommendation:** Develop and implement a growth strategy for research partnerships that establishes UNC Charlotte as the preeminent academic institution in the region for industry-sponsored and community-engaged research.

### Strategies and Tactics

- i) **Increase Opportunities for Industry Engagement and Partnerships:** The University should expand the number of industry engagement opportunities, including visits to campus by industry leaders and reciprocal visits to local companies by teams of faculty, to foster connections with regional and national corporations. The goal of these interactions is to establish opportunities to deepen the levels of engagement with industry, ranging from faculty consulting arrangements and student internships, to sponsored research and cooperative agreements, to collaborative research projects and joint applications for funding.<sup>19</sup>
- ii) **Establish a University-Wide Corporate Engagement Committee to Promote Information Sharing and Facilitate University-Industry Research Collaborations:** To promote more meaningful engagement with corporate and industry partners, UNC Charlotte should convene a committee of key campus stakeholders to coordinate University business development and partner stewardship. Supporting the work of a new director of corporate engagement and the Office of Research Partnerships, this committee will provide companies with a single institutional perspective and voice that matches UNC Charlotte's strengths with industry research and talent needs. The committee should include representatives from key campus units, including advancement, career services, constituent relations, research partnerships, continuing education, athletics, urban research and community development and research commercialization. Its charge should include developing central stewardship strategies and engagement pathways for industry engagement and coordinating interactions across campus offices and units. The committee would work to streamline and expand partnership development activities to better manage inbound requests and proactively seek partners through industry-specific needs assessments and through the development of engagement roadmaps that align a company's specific R&D needs with campus research strengths.
- iii) **Increase Non-STEM Research by Expanding Community-Engaged Research and Creative Discovery Focused on Social Impact:** The Charlotte region's intentional focus on issues of quality of life, racial equity and economic mobility provides increased opportunities for faculty and students to engage in research and creative discovery in areas of social impact that align with community demand and address issues of regional and national importance. Investments in these matters from philanthropic organizations and federal, state and local agencies present new sources of significant research investment and funding, especially in non-STEM areas such as the social sciences, humanities and creative arts.

The Office of Urban Research and Community Engagement and its associated units are uniquely positioned to assist in expanding research and scholarship focused on social impact. The office should (i) advance efforts that connect faculty,

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<sup>18</sup> UNT provides funding agency-specific training for their faculty and offers incentives for receiving grants from multiple agencies.

<sup>19</sup> UWM included the possibility for partnerships with local industry as a criterion for determining areas for strategic investment.

students and the University's interdisciplinary, urban research resources to community organizations and assets, (ii) identify and nurture emerging areas of excellence in social impact research, (iii) establish new and strengthening current research entities engaged in purpose-driven community initiatives, (iv) cultivate regional and national investments in community-engaged research to position UNC Charlotte for national recognition and funding and (v) refocus efforts on influencing local, regional and state policy on issues that impact the well-being of individuals, families and communities (e.g., transportation, land use, affordable housing, health disparities and outcomes and economic development).

## 2. Faculty Recruitment and Retention

- a) **Recommendation:** Develop a comprehensive strategy to increase tenure-track faculty positions by 15% (ca. 100-120 new lines) over the next five to seven years, especially in interdisciplinary areas of excellence and emerging priority.

Promoting interdisciplinary research and growing the University's research enterprise will require broad coordination and long-term planning across the campus. Deans and department chairs should work together to identify gaps in expertise that are needed to strengthen and expand areas of existing excellence or to establish a critical mass of faculty in an area of targeted growth. Hiring should include both early- and mid-career faculty with track records of productive collaborative research and creative activity that spans disciplines. For more senior hires, the University should expand the number of endowed professorships and chairs to attract and retain high-quality researchers and recognize outstanding faculty members who have distinguished themselves through scholarly and creative activity and accomplishments. A deliberate focus on ensuring racial and ethnic diversity will contribute to creating an environment that is attractive to all high-performing researchers.

### Strategies and Tactics

- i) **Adopt a Cluster-Hire Culture:** Several aspirational institutions cited "cluster hires" (simultaneously recruiting faculty into multiple departments around a multidisciplinary research area or theme) as a successful strategy to grow areas of strength or to establish core teams of faculty in emerging areas of priority.<sup>20</sup> Cluster hiring has been reinforced by changes in federal funding, which have moved from individual investigator awards toward supporting larger collaborative teams of interdisciplinary researchers that are better suited to address complex societal issues and research questions.

Cluster hiring would shift UNC Charlotte's faculty recruitment from the needs of a department or college to an interdisciplinary and institution-level focus. Informed by discussions with campus stakeholders, the University should develop a transparent process for identifying cluster themes and conducting the associated searches.<sup>21</sup> The search process should engage current faculty from the research area or theme. Unlike typical department-centric faculty recruitment, cluster hires should prioritize the needs and interests of the cluster over those of any single department, school or college. Consideration should be given to strengthening existing research centers or establishing new ones.

It is important to note that not all hires should be linked to a cluster. Cluster hires should supplement and complement more traditional department-level hires designed to fill critical teaching or research needs of the department or college.

- ii) **Seek Support to Establish New Endowed Chairs and Professorships:** Bestowing endowed chairs and professorships on senior-level faculty is an effective way to attract and retain the highest-quality researchers and scholars, advance academic excellence and recognize the contributions of the University's most creative and productive faculty. UNC Charlotte currently has 41 endowed professorships and chairs.

The provost and the vice chancellors for University advancement and research and economic development should (i) align existing professorships with identified areas of research excellence and (ii) seek gifts to establish new chairs and professorships to fill at least 15% of the 100-120 new faculty lines, with the long-term goal of having a quarter of the faculty positions endowed. The University should identify and recruit internationally recognized, highly collaborative researchers and scholars with a strong interest in adding value to UNC Charlotte by leading initiatives and research groups, building intellectual communities at the intersections of disciplines and mentoring early-career faculty in effective grant seeking. The payout from

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<sup>20</sup> Syracuse University set a goal to hire 200 new faculty members in interdisciplinary clusters. To be eligible for funding for new faculty positions, clusters were required to be "inter-college." Seven clusters were established in 2018 and an additional three clusters in 2019.

<sup>21</sup> FIU identified areas in which to build research strength and did cluster hires. The resulting programs were eligible for targeted investments.

endowed funds should include fiscal-year base salary and additional support for research activities. Finally, the University should establish chairs and professorships that can be granted, even on a rotational basis, to existing faculty who have distinguished themselves through their scholarly/creative activity and enhanced the reputation of the University through their professional work.

- b) **Recommendation:** Implement proactive, evidence-based practices designed to retain the University's most successful, diverse and productive faculty.

### Strategies and Tactics

- i) **Adopt a Proactive and Preemptive Retention Strategy:** Faculty retention efforts by UNC Charlotte and the UNC System largely focus on providing counteroffers to faculty who have received, or are likely to receive, formal competitive offers from other institutions. Such policies requiring outside offers are known to negatively impact retention efforts and faculty organizational commitment.<sup>22</sup> A more cost-effective strategy is to provide preemptive offers that discourage faculty from entertaining or seeking new opportunities. The Office of Academic Affairs, in consultation and collaboration with the deans and department chairs, should develop a comprehensive preemptive retention strategy to enhance the factors that help to retain faculty and strengthen institutional commitment (e.g., salary increases, supportive campus culture, excellent colleagues and students, deepening of community and campus ties) and to reduce those that may lead faculty to think their opportunities would be better elsewhere (e.g., isolation and alienation, occupational stress, unclear tenure and promotion expectations, perceived lack of institutional support or value).
- ii) **Expand Mentorship Programs for Early-Career Faculty:** Several aspirational institutions utilize research mentoring programs, like Catalyst, to improve retention rates of early-career faculty. Effective mentoring programs, including those offered by national organizations,<sup>23</sup> can help build research connections and professional networks, establish and sustain supportive and welcoming campus, department and college work environments, and help with navigating departmental culture and institutional bureaucracy. Colleges and departments should ensure that existing mentoring programs adequately address the needs of research-engaged faculty, reflect the traditions and values of individual departments and disciplines and are tailored to the needs of the faculty member (e.g., incorporate individual development and mentoring plans). Programs that specifically address challenges faced by underrepresented populations are highly encouraged.
- iii) **Provide Competitive Salaries for New Hires and Address Salary Compression (and Inversion) for Existing Faculty:** Minimal salary differences between faculty members at the assistant, associate and professor ranks can significantly impact morale, lead to tensions between colleagues and contribute to faculty turnover. Colleges should regularly evaluate and benchmark faculty compensation and establish permanent, recurring funds to address salary compression.

To provide more competitive salaries and startup packages for new hires, the University should pay equal attention to alleviating salary compression and avoiding possible salary inversion. A variety of tactics and resources, including regular merit pay increases, salary adjustments, chaired professorships and reduced loads, should be used to recognize excellence and reward faculty for their productivity and contributions, especially those that help to grow the University's research enterprise and contribute to the University's progression toward top tier.

### 3. Graduate Program Growth and Student Success

- a) **Recommendation:** Target key graduate programs for growth and expansion, especially those that are aligned with areas of research strength and that fill regional and state workforce needs.

### Strategies and Tactics

- i) **Launch New Doctoral Programs in Targeted Areas:** The lack of doctoral programs in the humanities is a clear gap that differentiates UNC Charlotte's performance relative to top-tier aspirational institutions. Awarding Ph.Ds. in four broad categories (STEM, Social Sciences, Humanities and Other) is not required to be a top-tier institution. However, adding even a single

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<sup>22</sup> O'Meara, K. 2014. Half-way out: How requiring outside offers to raise salaries influences faculty retention and organizational commitment. Res. High. Edu. DOI 10.1007/s11162-014-9341-z

<sup>23</sup> See for example programs and training provided by the Center for the Improvement of Mentored Experiences in Research (CIMER) <https://cimerproject.org/>



humanities doctorate program would likely have a substantial impact on UNC Charlotte's relative position among peer and aspirational institutions, even more so than awarding a comparable number of doctorates from STEM programs. The dean of the Graduate School should work with college deans and the UNC System to establish at least one new doctoral program in the humanities.<sup>24</sup>

- ii) **Monitor the Health, Success and Scope for Growth of Graduate Programs:** Developing and launching new doctoral programs often takes several years — and longer before the program contributes to the graduate degree productivity. Any near-term increases in doctoral degree recipients will likely come from increasing the size, capacity and completion rates of existing programs. The Graduate School should work with program directors to conduct a comprehensive assessment of the existing doctoral programs to determine those poised for growth and develop a strategy for maximizing their potential.<sup>25</sup> The evaluation should establish a shared set of student success metrics, including retention and persistence rates, funding levels (e.g., number of students supported by external grants) and time to degree completion, to monitor program health and identify potential factors impacting program productivity. Interventions and incentives that promote increases in program persistence and completion should be considered.
  - iii) **Align Doctoral Training with Areas of Excellence and Local Industry Needs:** Graduate students are the engine that drives research growth. Consequently, the training and focus of existing graduate programs should be aligned to support current and emerging areas of excellence. Similarly, to support corporate R&D activities, establish a pipeline for student placement and employment and enhance opportunities for collaborative industry-inspired research, programs should be encouraged to align doctoral-level skills and talent development to local industry needs.<sup>26</sup>
- b) **Recommendation:** Require and foster support for graduate students on sponsored awards to facilitate the growth of current programs, provide more competitive compensation packages and enable programs to successfully recruit the highest quality graduate students.

### Strategies and Tactics

- i) **Implement Strategies for Increasing the Number of Students Supported on Sponsored Awards:** For the University to increase doctoral degree productivity to meet the levels projected for advancement to top tier, PIs must commit to supporting more graduate students on extramural grants. Consideration should be given to incentivization and accountability programs that establish program-level milestones or targets for student support (e.g., RA FTEs/year supported on external grants and contracts) that are linked to additional University investments. These "rewards" could include the allocation of additional University-funded graduate assistantships or tuition awards. Programs should regularly benchmark the compensation packages provided to graduate assistants to ensure they remain competitive.
- ii) **Actively Seek Support for Federally Sponsored Graduate Traineeships and Fellowships:** Federally sponsored traineeship grants, including the NIH T32 and NSF Research Traineeship (NRT) program, provide significant financial support for institutions to recruit and train cohorts of doctoral students in new and emerging STEM fields. The University should prioritize and support teams of faculty interested in preparing competitive T32 or NRT proposals that align with areas of existing and emerging research strength. Similarly, the University should develop programs to encourage and assist students with preparing and submitting competitive fellowship applications to external sponsors. Colleges and programs should implement evidence-based programs that provide more personalized support and complement and extend the centralized training provided by the Center for Research Excellence and/or the Graduate School.

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<sup>24</sup> UWM made increasing the number of Ph.D. programs a priority to grow overall research.

<sup>25</sup> The University of Texas System provides incentives to its institutions, such as UNT, for growing the number of Ph.D. students.

<sup>26</sup> The possibility of partnerships with local industry was a criterion used in UWM's determination of potential areas of research excellence.

#### 4. Research Policies, Infrastructure and Administration

- a) **Recommendation:** Update policies and streamline procedures to lower the administrative burden on faculty and staff and to encourage participation in sponsored research.

##### Strategies and Tactics

- i) **Adopt a Service-Focused and Scalable Organizational Structure for Grants Administration:** Aspirational Institution representatives cited the development of an efficient, responsive, supportive and scalable pre- and post-award research administration office as a key component of their success in advancing to top tier. The Office of Research and Economic Development should examine the University's decentralized, distributed structure for pre- and post-award administration to determine whether it aligns with the current size and anticipated growth of the research enterprise. In addition to identifying recurrent problems for PIs and areas for process and service improvement, the assessment should determine if consolidating services and restructuring staff reporting would (i) increase productivity and efficiency, (ii) improve the consistency and quality of services to PIs, (iii) enable and promote cross-training, (iv) facilitate continuity planning and (v) create more opportunities for staff to enhance their skills and knowledge and prepare for more advanced roles and positions.

To help sustain a customer-centric mindset, research offices should conduct frequent satisfaction surveys to gather qualitative feedback on staff performance and to provide context for performance metrics that monitor workloads and productivity, processing times, submission timelines and quality.<sup>27</sup> Supervisors should continue to highlight communication and customer service skills, in addition to technical knowledge, aptitude for learning and attention to detail as highly desired qualities for research administration staff.

- ii) **Fully Exploit the Capabilities of the New eRA System to Integrate Processes and Increase the Efficiency, Accuracy and Speed of Research Administration:** UNC Charlotte is launching Niner Research, a new online research administration system to replace the NORM system (adopted from UNC-Chapel Hill). The expanded features and flexibility of Niner Research provide opportunities to tailor and customize the front- and back-end components to meet the needs of the campus and to connect eRA modules with other campus systems, such as Banner. The Office of Research and Economic Development should continue to refine the system and use future upgrades to lower the administrative burden on faculty and staff, especially the financial and regulatory components of the research process. Efforts should focus on streamlining workflow and compliance tracking, improving reporting processes, increasing the efficiency, accuracy and speed of administrative actions and providing researchers with access to information that accurately reflects award status and offers near real-time information and accounting of research activities.
- iii) **Develop and Adopt a Set of Campus Research Metrics to Monitor Progress to Top Tier:** To help track UNC Charlotte's progress toward top-tier status and to evaluate the success of strategies and interventions designed to accelerate the growth of the research enterprise, the University should develop a list of research activity and productivity metrics. These metrics should complement research administration metrics and key performance indicators on workflows, productivity and PI satisfaction with research support and services. The metrics should be accurate, relevant and meaningful, and they should align with both short- and long-term goals and strategic initiatives.<sup>28</sup> Displaying the metrics on an online dashboard visible to faculty and staff will support decision making and accountability and will enable campus units to (i) evaluate the success of interventions aimed at stimulating research, (ii) make informed decisions regarding resource allocations and (iii) assess the University's progress toward its goal of reaching top-tier status. (See Appendix B for a comprehensive list of potential research metrics and indicators.)

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<sup>27</sup> The VPR at UTEP stresses a culture of service in the Office of Sponsored Programs, which he terms an "Office of Engagement." He credits this attitude for helping UTEP's ~520 faculty members submit 665 proposals in the 2020-21 academic year.

<sup>28</sup> At FIU, the provost centralized data collection within the Research Office to create a set of standardized, mutually agreed-upon metrics for all colleges.

- b) **Recommendation:** Develop and implement a strategy for enhancing the University infrastructure for research, including shared equipment and facilities.

#### Strategies and Tactics

- i) **Expand and Modernize Existing Research Facilities:** Growing the University's research enterprise will require a comprehensive and cost-effective plan to upgrade and expand the campus's current facilities and provide researchers access to advanced instrumentation and technologies. The offices of Academic Affairs and Research and Economic Development should collaborate on a plan to reduce redundancy and expand shared-use facilities, including the development of additional centralized research resources and "core facilities" that provide researchers with access to state-of-the-art instruments, services and/or expert consultation. In addition to reducing ongoing costs, the plan should include the development of a comprehensive inventory of existing instruments and the establishment of policies and procedures to guide their shared use by faculty and students.
- ii) **Align Investments in Equipment and Instrumentation with Research Priorities and Thrusts and with Regional Industry Needs:** Many research instruments and technologies are too expensive for an individual investigator to purchase on a grant or startup package. The Office of Research and Economic Development should consider launching a program to support the replacement and acquisition of shared research equipment. The office should continue to support the preparation and development of competitive proposals to instrumentation and infrastructure grant programs, such as the NSF Major Research Instrumentation (MRI) program and NIH S10 Instrumentation Programs. Preference should be given to multiuser instruments that advance research priorities and thrusts. Consideration should be given to acquiring instruments that (i) contribute to the advanced training of students, (ii) are unavailable elsewhere in the region and (iii) support the needs of regional academic and industry partners.
- c) **Recommendation:** Adopt policies and procedures that fully capture and report the University's sponsored research activity and investment in research, scholarship and creative activities.

#### Strategies and Tactics

- i) **Ensure the Full and Accurate Reporting of Research-related Expenditures:** The vice chancellor for research and economic development and the executive director of grants and contracts should work with academic units to ensure information reported annually to the NSF's Higher Education R&D (HERD) survey fully captures and accurately reports the University's investment in research, especially institutional investments that may not be tracked by the campus electronic research administration and financial systems.
- ii) **Develop Policies to Encourage the Full Recovery and Reinvestment of Facilities and Administrative (F&A) Costs:** F&A costs charged to sponsored awards represent a partial reimbursement for indirect costs already incurred by the University in support of research activities during a fiscal year. Although the actual F&A costs that support sponsored research are well above the University's current federally negotiated rate, the average effective recovery rate is far lower. The vice chancellor for research and economic development should work with the chancellor to develop policies that (i) encourage faculty to pursue funding opportunities that permit the full recovery of indirect costs and (ii) reinvest F&A dollars in programs and initiatives that lead to significant research growth and expansion of shared infrastructure and resources.

### 5. Research Recognition and Communication

- a) **Recommendation:** Communicate and celebrate faculty and student research successes (e.g., grants, fellowships, honorific awards, commissions, publications) of all sizes and from all disciplines.

#### Strategies and Tactics

- i) **Develop and Implement a Comprehensive Research Communication Plan:** Growing the University's research enterprise will require a comprehensive, targeted strategy that successfully communicates the value of research discoveries, scholarship and creative expression and amplifies their impacts and contributions to society to a range of audiences. To highlight the importance of research communication, the Office of University Communications (UCOMM) should partner with the Office of

Research and Economic Development to establish a new campus unit focused on research communication and marketing.<sup>29</sup> The office, embedded in UCOMM, should develop and implement a comprehensive communication plan and strategy designed to: (i) coordinate research communication efforts across campus, (ii) build awareness (both internally and externally) of the University's research capabilities, creative and scholarly expertise and talent, (iii) align communication efforts with the University's research goals and areas of strategic focus, (iv) establish priorities and approaches to promote the highest impact research stories and discoveries and (v) optimize communication channels and platforms to convey tailored messages to different audiences and stakeholders for maximum impact and engagement.

- ii) **Establish New University-Wide Honorific Awards that Recognize Research Excellence<sup>30</sup>:** To continue to encourage a campus climate that values and celebrates faculty excellence and distinction in research, scholarship and creative expression, UNC Charlotte should expand the list of campuswide faculty awards to include accumulated records of achievement and specific milestones or pieces of research, creative work, scholarship or funding success (e.g., \$10M Club). Moreover, the Office of Research and Economic Development should collaborate with college deans to develop strategies to increase the number of faculty receiving prestigious honorific awards from national and international societies and organizations. This approach should include the development and curation of a searchable database of target awards, use of data analytic tools to identify and match faculty with prospective opportunities and expert assistance with developing and submitting nomination packets.

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<sup>29</sup> UTEP celebrates all research awards of any size and in every discipline with announcements and stories by the University Communications Office.

<sup>30</sup> Successful GSU faculty may be named distinguished professors and are eligible for the statewide designation of Regent Professor.

## Appendices

### APPENDIX A: REVIEW AND SELECTION OF AREAS OF RESEARCH FOCUS AND DISTINCTION

#### 1. Call for Nominations

The Commission issued a call for applications on Feb. 4, 2021, with a due date of Feb. 26, 2021. Self-nominations were encouraged from teams of campus researchers and directed at three broad categories:

- 1) **Areas of Existing and Emerging Excellence:** Broad areas of outstanding research and scholarship that include existing signature programs of disciplinary and interdisciplinary strengths and new, emerging clusters of research-productive faculty.
- 2) **Areas of Unique Distinction:** Small teams of collaborating faculty that have achieved international prominence in an area or field of study.
- 3) **Areas of Future Opportunity and Investment:** New or emerging research areas, often linked to national, regional or statewide priorities, where UNC Charlotte is positioned to excel.

Nomination packets included five components:

**Cover Page** (1 page): The title of the area, a list of participating disciplines/academic units/departments and the names of up to three individuals responsible for leading and organizing the collaborative cluster.

**Executive Summary** (1 page): A short synopsis of the core/thematic area and a summary of the evidence supporting its nomination as an existing or future area of excellence/unique distinction.

**Evidence of Strength and Excellence** (2 pages): A description of the strengths of the collaboration(s) explaining how the area can achieve excellence and national prominence, or has already done so, and describing evidence of the success and collective impact of the group, including joint publications, major awards, and honors recent (past five years) funding success, citation impact, media attention/reach, engagement with external entities (local/regional communities, NGOs, industry, national labs, etc.) and the broader impacts of the research outcomes. Applicants were asked to describe (i) the strengths of individuals as well as the cohesion of the group and its success as a collaborative team (e.g., joint publications and proposals), (ii) how additional resources might be used to build or expand upon past success and (iii) the group's contribution to student education and research training, especially of doctoral students.

**Alignment with Regional and National Priorities** (1 page): A description of how the area aligns with regional, national and international priorities and supports the mission of UNC Charlotte.

**Supporting Documents:** Names, titles and short descriptions of the contribution or expertise of each member and a short, two-page CV of participating and contributing faculty members.

#### 2. Review Process and Criteria

Eight-two applications were received by the Feb. 26 deadline, including 51 to the area of existing and emerging excellence, nine to the area of unique distinction and 22 to the area of future opportunity and investment. A total of 592 faculty and staff participated in the process. Although individuals were permitted to lead only one submission, 304 faculty and staff participated in multiple submissions (average=2.0 submissions/individual; range: 1-7).

Given the submissions' diversity of themes, the Commission's approach to evaluating and selecting the final slate was to establish broadly defined criteria (described in the call for nominations) and ask submitters to use evidence relevant to the disciplines and fields represented in the nomination to build a compelling case to match the criteria. Nominations were assessed using a two-phase process. During the first phase, independent reviews and panel discussions by commission members guided the selection of the most competitive nominations. Care was taken to avoid potential conflicts of interest when making review and panel assignments. For the second phase, the Commission sought independent, expert evaluations from external peer reviewers with diverse backgrounds and perspectives. These reviewers' scores and evaluations informed additional discussions among the Commission members that ultimately led to the selection of the final slate of areas.

## a) Phase I Review

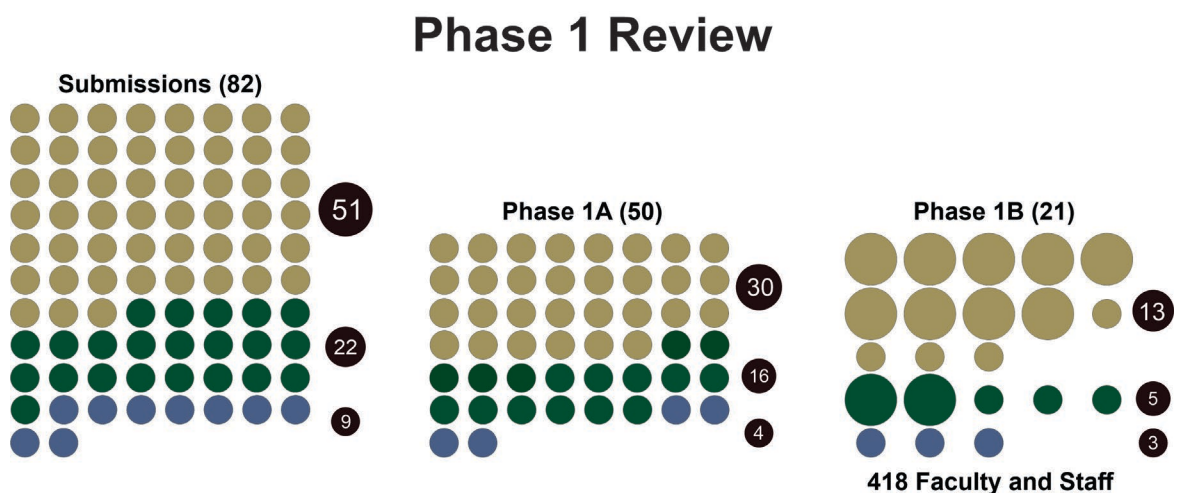
During the first stage, three members of the Commission independently scored each nomination on the criteria below using a five-point Likert scale (1: A great deal to 5: Not at all), acknowledging that some criteria might not apply to all nominations or provide a meaningful assessment of a nomination's strength:

To what extent does the proposed area or associated team:

- Have an existing track record of excellence in the thematic area?
- Address one or more complex and key questions facing society with the potential for transformative impact?
- Explore creative and original concepts?
- Possess a demonstrated track record of collaboration and/or teamwork (e.g., co-publications, co-supervised students, collaborative grants)?
- Align with regional, state and national priorities?
- Promote new collaborative partnerships among University researchers?
- Complement and enhance existing and emerging areas of research excellence at UNC Charlotte?
- Have the potential to attract new and/or significant extramural funding?
- Have the potential to compete for large-scale grants from federal and state agencies?
- Include a diverse group of researchers representing a range of disciplines?
- Support doctoral and postdoctoral scholar training?
- Support economic development through commercialization and industry partnerships?

Reviewers also were asked to provide an overall evaluation of each nomination, ranging from excellent to poor.

These initial assessments were used to select the most competitive nominations within each category. Commissioners categorized nominations as highly competitive, competitive or not competitive. Prior to the final categorization, commission members met as a panel to discuss nominations with mixed or discrepant scores and to clarify questions raised by the initial review. The two most competitive groups advanced to the next stage (Figure 2).



**Figure 2:** Diagrammatic representation of the selection and grouping/clustering of nominations for areas of focus and distinction. Phases 1A and 1B were conducted by members of the Commission. Gold, green and blue circles represent nominations submitted to the categories of existing and emerging excellence, future opportunity and investment and unique distinction, respectively. In Phase 1B, nominations in complementary areas were combined to form multi-nomination clusters (represented by larger circles).

During Phase 1B, commissioners were assigned to review panels (two or three commissioners per group) and charged with re-evaluating the 50 most competitive proposals with the goal of (1) reassessing the strengths of nominations and their competitiveness group assignments and (2) identifying nominations with complementary themes or natural connections and synergies that would benefit from being grouped into larger, multi-nomination clusters under a broader or inclusive theme.

Clusters of nominations could include submissions from other categories (e.g., existing and emerging excellence, unique distinction and future opportunity and investment). Ultimately, 21 finalists (10 single nominations and 11 nomination groups or clusters consisting of two or more original submissions) were advanced to Phase 2. Thirteen were assigned to the category of existing or emerging excellence, three to unique distinction and five to future investment (Figure 2).

b) Phase 2 Review

As metrics alone cannot accurately measure scholarly excellence, research productivity and collaboration across all fields and disciplines, the Commission took a holistic approach to evaluating the strengths of the 21 finalists during the second phase. Independent peer reviews were solicited from experts from U.S. universities. Reviewers were identified based on their expertise in the areas represented in the submission. Most (78%) reviewers were affiliated with top-tier institutions and held the academic rank of associate or full professor. Care was taken to avoid conflicts of interest when matching reviewers to nominations.

Reviewers were asked to evaluate nominations or clusters of nominations using the same review criteria and Likert scale employed in Phase 1A. Additionally, they were asked to provide an overall rating of the nomination (excellent to poor) and encouraged to summarize strengths and weaknesses. Each reviewer evaluated only one nomination, and each nomination received at least three reviews. A total of 89 reviews were returned, with an average of 4.2 reviews per nomination (range 3 to 6).

Three additional metrics were used to evaluate and benchmark each nomination and to assess the aggregate scholarly activity and sponsored research activity of the individuals participating in the submission (Figure 3). They included:

- 1) **Scholarly Research Index (SRI):** Mean research scholarly index provided by Academic Analytics<sup>31</sup> for the faculty listed on each nomination or cluster of nominations. The person-level SRI is a composite score, based on several research metrics (journal articles, total citations, books, grants, grant dollars, total awards, conference proceedings) that are weighted according to the faculty member's unit taxonomic classification or discipline. It is displayed as a z-score and is benchmarked against other researchers in the same discipline at a similar career stage (i.e., time since terminal degree).
- 2) **Research Expenditures:** Total and median research expenditures for fiscal years 2018-2020 for each faculty member participating in the nomination or cluster of nominations. Expenditures were based on the individual's contribution to the sponsored project and only expenditures at UNC Charlotte were included.
- 3) **Research Engagement Index:** Percentage of the faculty participating in the nomination or cluster of nominations with active extramural grants or contracts at any time during fiscal years 2018-2020.

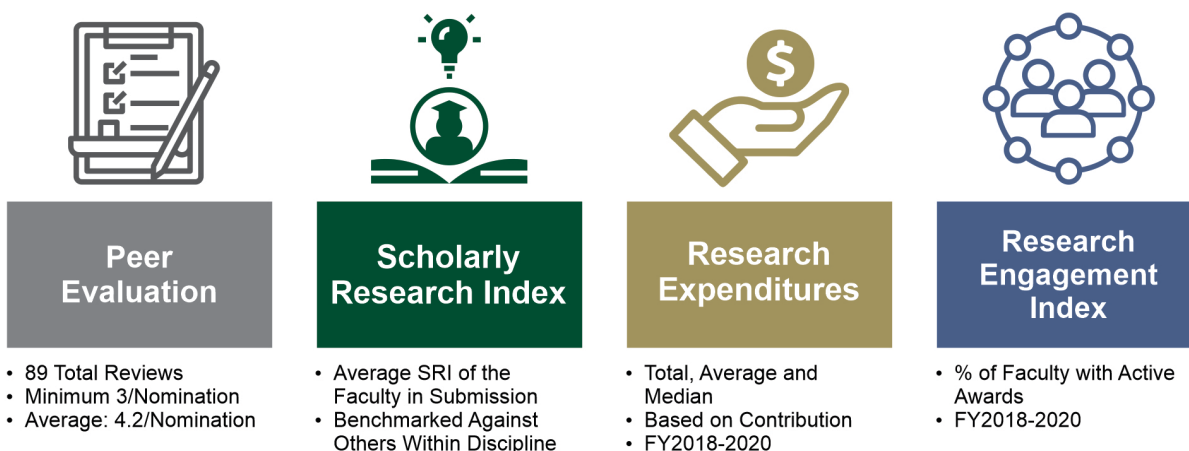


Figure 3: Evaluation criteria and metrics used during Phase 2 to select final areas of focus and distinction.

<sup>31</sup> <https://academicanalytics.com>

**APPENDIX B: FACULTY AND ADMINISTRATORS FROM ASPIRATIONAL INSTITUTIONS THAT PARTICIPATED IN SEMI-STRUCTURED INTERVIEWS.**

<b>Name</b>	<b>Title</b>	<b>Institution</b>
Andrés Gil	Vice President for Research and Economic Development; Dean of the University Graduate School; Professor, Robert Stempel College of Public Health and Social Work	FIU
Aurali Dade	Associate Vice President for Research, Innovation and Operations, and Deputy Chief Research Officer	GMU
Rebekah Hersch	Interim Associate Vice President for Research & Innovation	GMU
Mike Laskofski	Associate Vice President for Research Services	GMU
Elliott Albers	Regents Professor of Neuroscience and Director of the Center for Behavioral Neuroscience	GSU
Kelly Stout	Assistant Vice President for Research Operations & Strategic Initiatives	GSU
Binghe Wang	Regents Professor; Georgia Research Alliance Eminent Scholar, Department of Chemistry, and Director, Center for Diagnostics & Therapeutics	GSU
Ramesh Raina	Interim Vice President for Research	Syracuse
Vince Delio	Director for Strategic Initiatives, Data Assessment & Technology	UAlbany
James Dias	Vice President for Research	UAlbany
Jeffrey Gerken	Interim Director of Institutional Research	UAlbany
Satyen Kumar	Associate Vice President for Research	UAlbany
Bruce Szelest	Chief of Staff	UAlbany
Mark Harris	Vice Provost for Research; Interim Dean, School of Information Studies; and Professor of Geosciences	UMW
David Hatchett	Associate Vice President for Research and Professor of Chemistry and Radiochemistry	UNLV
Jennifer Cowley	Provost and Vice President for Academic Affairs	UNT
Mark McLellan	Vice President for Research & Innovation	UNT
Jack Chessa	Professor and Department Chair of Mechanical Engineering	UTEP
Carlos Ferregut	Professor and Department Chair of Civil Engineering	UTEP
Roberto Osegueda	Vice President for Research	UTEP



**APPENDIX C: PROPOSED RESEARCH METRICS FOR TRACKING PROGRESS TO TOP TIER**

Category	Metric		
Proposals	Count	Year to Date	
		Relative to Previous Year	
		Monthly Total	
		By College	
		By Department	
		By Center/Institute	
		By Size Category (<\$100K, \$100K-\$500K, \$500K-\$1M, >\$1M)	
		By Sponsor Type	
		By Federal Agency	
		With Industry	
		With Community Partner/Non-profit	
		Size/Value	Year to Date
			Relative to Previous Year
	Monthly Total		
	By College		
	By Department		
	By Center/Institute		
	By Sponsor Type		
	Awards	Count	Year to Date
			Relative to Previous Year
Monthly Total			
By College			
By Department			
By Center/Institute			
By Size Category (<\$100K, \$100K-\$500K, \$500K-\$1M, >\$1M)			
By Sponsor Type			
By Federal Agency			
By Carnegie Classification (STEM vs. Non-STEM)			
With Industry			
With Community Partner/Non-profit			
Size/Value			Year to Date
	Relative to Previous Year		
	Monthly Total		
	By College		
	By Department		
	By Center/Institute		
	By Sponsor Type		
Expenditures	Size/Value by Type (Direct, F&A, Total)	Year to Date	
		Relative to Previous Year	
		Monthly Total	

		By College
		By Department
		By Center/Institute
		By Sponsor Type
		By Federal Agency
		Total Federal
		Total R&D
		Total Industry Sponsored
		Total Institutional
		Per Tenure/Tenure-Track Faculty
		Relative to Top-tier Projection
		Effective F&A rate
<b>Productivity</b>	<b>Count</b>	Scholarly Peer-Reviewed Publication
		Scholarly Books
		Creative Works
		Tenure/Tenure Track Faculty with Sponsored Projects
		Honorific Awards
		Tenure/Tenure Track Faculty Submitting Proposals
<b>Nonfaculty Researchers</b>	<b>Count</b>	Number of Research Faculty
		Number of Post-doctoral Researchers
		By College
		By Department
		By Center/Institute
<b>Doctoral Programs</b>	<b>Enrollment</b>	Full-time Enrollment
		By Program
		By College
	<b>Degrees Awarded</b>	By Program
		By College
		Relative to Top-tier Projection
	<b>Program Health</b>	Time to Graduation
		5 and 6 yr. Graduation Rate
		1, 3, 5 yr. Persistence Rate
		Students Supported on Sponsored Award/Contract (FTE)
Students Supported on Traineeship or Fellowship		
<b>Facilities</b>	<b>Size/Value</b>	Expenditures/Sq ft Research Space (Net Assigned)
		By College
		By Department
		Core Facility Revenue (Recharge Unit)
<b>Faculty Innovation and Commercialization</b>	<b>Count</b>	Disclosures
		Patent Applications
		Provisional Patent Applications
		New Patents
		New Patents (5-yr running average)
		New Licenses and Options
		Total Active Licenses and Option Agreements

		Startups (Faculty and Students)
		Participants (faculty and students) in Ventureprise programs
	<b>Amount</b>	Licensing Revenue
<b>Internal Grant Proposals</b>	<b>Count</b>	Year to Date
		Relative to Previous Year
		Monthly Total
		By College
		By Department
		Faculty Participating
	<b>Size/Value</b>	Year to date
		Relative to previous year
<b>Faculty Hires and Retention</b>	<b>Count</b>	Number of new, tenure-track faculty lines
		Net gain/loss of tenure track faculty
		Number of Endowed Chairs/Professorships

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