

# UNT's Strategic Plan for Research: 2017-2022

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February 2017

**Research Mission:** *UNT's research enterprise prepares students to join the next generation of the technical workforce through both education and research experiences, enriches faculty members' contributions through scholarly and innovative expression, and supports sponsoring entities' need for scientific and technological innovation.*

**Research Vision:** *UNT's research enterprise will be significantly enhanced, and as a result UNT will maintain its status as a Carnegie Institution Tier One Research University and reach state of Texas recognition as a National Research University.*

## UNT's Strategic Plan for Research: 2017-2022

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## Part I. The University of North Texas Mission and Vision

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### UNT's Mission

UNT is a major public research university deeply committed to advancing educational excellence and preparing students to become thoughtful, engaged citizens of the world. This is accomplished through a broad and balanced array of programs where well-prepared students and dedicated scholars and artists collaborate with our local and global communities in the creation, integration, application, and dissemination of knowledge. In this way, UNT creates an enriched and sustainable future for our students, state, nation and world.

*UNT's research enterprise prepares students to join the next generation of the technical workforce through both education and research experiences, enriches faculty members' contributions through scholarly and innovative expression, and supports sponsoring entities' need for scientific and technological innovation.*

### UNT's Vision

As the most comprehensive public research university providing a top quality education in one of the nation's largest, most dynamic regions, UNT will be celebrated for its academics, arts, and athletics. UNT will be a diverse and inclusive institution creating knowledge and innovations that will shape the future, while cultivating excellence in the next generation of scholars and leaders for the global community.

*UNT's research enterprise will be significantly enhanced, and as a result UNT will maintain its status as a Carnegie Institution Tier One Research University and reach state of Texas recognition as a National Research University.*

Established in 1890, the University of North Texas has grown to serve nearly 38,000 students and has become one of the state and nation's largest public research universities. UNT offers 100 bachelor's, 83 master's, and 37 doctoral degree programs, welcoming diversity and collaborating with many education, business, research, and community partners.

Designated by the state of Texas as an Emerging Research University, and in 2015 achieving Carnegie Classification as one of the nation's "Doctoral Universities: Highest Research Activity" ("Tier One"), UNT aspires to significantly enhance its research enterprise. This is important because it contributes to preparation of the future technical workforce of the region and nation, drives economic prosperity and development, and enriches scientific and engineering knowledge, practice, and innovation.

## Part II. Plan for Research Funding and Productivity

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To achieve UNT's vision of maintaining Carnegie Tier One classification and achieving state of Texas recognition as a National Research University, three principal actions are required:

- Action 1.** Increase the amount of research expenditure per faculty member,
- Action 2.** Increase the number of research-active faculty members, and
- Action 3.** Increase the efficiency of research space utilization (expenditure per square foot), the quality of existing research space, and the total amount of research space available.

Pursuing these actions will be aimed at

- Outcome 1.** Reaching the UNT Board of Regent's five year target of having \$31.5M in annual restricted research expenditures\* by 2022,
- Outcome 2.** Reaching the state of Texas National Research University target of \$45M in annual restricted research expenditures by 2025,
- Outcome 3.** Increasing the number of science and engineering programs ranked nationally within the top 100 of their peers, and
- Outcome 4.** Increasing the number of science and engineering graduate students and maintaining and growing the number of graduate degrees awarded annually (especially the number of doctoral degrees annually).

Specifically, taking actions to achieve these outcomes will require a combination of increasing sponsored research project award size from existing faculty members (Action 1), increasing the number of research-active faculty members through new hires that can establish or bring with them significant new sponsored research projects (Action 2), and better utilizing existing research space and creating new space to support an increased number and size of sponsored projects (Action 3).

UNT's plan to increase the average size of sponsored projects and to increase the number of research-active faculty members is underpinned by a fundamental assumption, namely, the targeted average annual restricted research expenditure per faculty member. A reasonable estimate for this is based on the performance of the science, technology, engineering, and mathematics (STEM) tenured/tenure track (T/TT) faculty of our Texas Emerging Research University and National Research University peers (UTA, UTD, UTSA, UTEP, TX State, TX Tech,

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\* Annual restricted research expenditures as defined by and reported to the Texas Higher Education Coordinating Board (THECB)

and the University of Houston). Annual restricted research expenditures in FY15 reported to the THECB, and an estimation of the numbers of STEM T/TT faculty members through publically available faculty lists, indicates that this peer group averages approximately \$130K per STEM T/TT faculty member per year in restricted research expenditures, significantly exceeding the value of this metric for UNT at present (about \$70K), and therefore setting a benchmark for our goals.

### **Increase the amount of research expenditure per faculty member**

Since UNT lags the average annual restricted research expenditure per STEM T/TT faculty member of our Texas peer group of research universities it is imperative to improve this measure. A five year target will be to reach our peers' annual average. To do so, several strategies will be employed. In addition to strategic allocation of resources, these strategies include alignment of policies with best practices of universities with larger research enterprises, encouraging evolution in university community culture, and aligning of priorities with the envisioned outcomes.

### ***Improved support for proposal submission and administration***

As a foundation for greater success in proposed sponsored projects, we have begun by improving, and making plans for further improvement, of services provided to faculty members by the Office of Grants and Contracts Administration. These actions have included adoption of an industry standard electronic proposal administration software platform to expedite internal routing, approval, and electronic submission of proposals. In addition, UNT has improved grants and contracts business practices to provide improved "customer service" aimed at better supporting faculty members in grant preparation and submission. We have also initiated several principal investigator trainings to improve faculty members' awareness of present federal, state, and university policies and procedures for proposal submissions and grant execution, accounting, and reporting.

The next phase of providing enhanced support for faculty members will be implementation of *Faculty Connect*, a program to connect faculty members with research opportunities as well as with prospective students seeking research mentors. The Office of Research and Innovation has also re-organized its intramural grants and awards programs to focus on support for projects that can seed high-return-on-investment follow-on sponsored projects, while maintaining significant support for scholarly and creative endeavors and to recognize leadership and accomplishment in research, scholarly, and creative achievements.

### ***Focused institutional investment***

This re-organization of intramural grants and awards reflects plans to increasingly focus investment on institutional research strengths. The goal will be to achieve higher numbers of nationally recognized research programs and individual investigators, and to spur larger

sponsored project awards that can come from multi-principal-investigator, multi-institutional, and multi-disciplinary research. Central to this strategy has been the inauguration of four *Institutes of Research Excellence*, seeded through intramural support and aimed at catalyzing nationally recognized large, multi-investigator research programs. These *Institutes* reflect existing and targeted institutional strengths in plant biology-based products, advanced materials and manufacturing, environmental research, and logistics research. The goals and present status of the *Institutes* are described below in Part VI.

### ***Leverage gained from centrally supported research facilities***

Another strategy to enable larger average grant size has been increased support for existing major shared-instrumentation research facilities in material sciences and allied research areas and in computing and information sciences, as well as the establishment of new shared research facilities in biological sciences and logistics research. Such shared facilities create suites of instruments that would not be available to individual investigators, encourage multi-investigator research, and provide unique equipment supported in the long term by user fees and university funds for service contracts and technical staff. In particular, the availability of shared resources, and support of their operation and maintenance, enhances the likelihood of success of both individual and multiple investigator proposals. This often enables these proposals to be of a larger than average size. For research areas of institutional strength supported by the shared facilities, they also enable greater leverage of faculty start-up funds and avoid duplication of sharable equipment.

### ***Adoption of other “best practices”***

Increasing the average size of sponsored projects will also be aided by adopting best practices of research universities we aspire to be more like. For example, we are changing practices to encourage and to facilitate support for research track faculty members such as research professors and research scientists, supported on “soft money”. Such non-T/TT faculty are supported entirely on sponsored projects, most often participating in and enhancing group-oriented research with T/TT faculty members, students, and postdoctoral fellows, and are thus a significant source and catalyst for research output and sponsored project success. We will also seek to adopt best practices regarding evaluation of research success and promote recognition of this success within the broad context of faculty success at UNT. Emulating our research university peers, we will seek to promote a culture that is supportive of research at a new and higher level in complement and synergy with excellence in the other strengths of the university.

### ***Outcomes***

UNT’s three year (FY13-FY15) average annual total research expenditure was \$45.8M and average annual restricted research expenditure was \$17.5M. By increasing the annual restricted research expenditure per STEM T/TT faculty member to our peer average UNT could significantly increase restricted research expenditures. Coupled with the University’s

commitment to increase support for new graduate student lines, increased research activity would also contribute to the growth of graduate degrees awarded and to higher national ranks of research departments.

## **Increase the number of research-active faculty members**

### ***Making strategically targeted hires***

Growing annual restricted research expenditures further, to reach the UNT Board of Regent's five year target of \$31.5M by 2022 and after that the state of Texas National Research University target of \$45M, will require hiring new faculty members who will bring research funding with them at least at our Texas peer average of \$130K/yr, for about \$1.3M/yr additional research expenditure per 10 new, impactful hires.

The new hires will be made in areas of institutional research strength to gain synergy from the existing or emerging nationally recognized programs, prime examples which are the four *Institutes of Research Excellence*. Each of the *Institutes* seek to leverage success and activities of multiple principal investigators, their connections with multiple institutions, and the supporting relationships between multiple disciplines. Their goal is to achieve nationally recognized programs and pursue sponsored projects beyond typical single investigator scope and impact.

### ***Outcomes***

Like achieving greater average sponsor project size by existing faculty members, success of the new hires will contribute to increased numbers of graduate degrees and improved ranks of research active departments. Reaching these goals will require strategic commitment of significant resources. To begin with, this will require competitive start-up support and salaries to attract the new hires and to enable support of the sponsored projects they bring with them or quickly succeed in winning. Linked with Actions 1 and 2, resources will also be required to further develop UNT's shared research facilities and, as addressed in Action 3, for renovation and construction of state-of-the-art research and collaborative space.

## **Increase the efficiency of research space utilization, the quality of existing research space, and the total amount of research space available**

Indeed, optimized use of research space is important to enabling the research of present faculty members, attracting new hires that bring grant funding with them, and balancing space allocations for research with important needs for instructional space. Therefore, increasing research productivity and supporting new hires to maintain and grow the research enterprise at UNT will require making the best use of the research space presently available, renovating space to better support research, and building new, state-of-the-art research space.

### ***More efficient and effective use of research space***

Analysis based on 2015 data supplied to the THECB shows that UNT lags our Texas research university peers in the efficiency and effectiveness of utilizing research space. For example, considering how much research space is used at UNT per \$1M in annual research expenditure (“*research space efficiency*”) compared to that at our peer institutions, we use about 1.6 times as much space for the same amount of sponsored research. Similarly, the amount of research expenditures we have per square foot of research space (“*research space effectiveness*”) is about 2.5 times less than the average of our peers. Therefore, as we work to reach our goals for research we must seek to improve these efficiency and effectiveness measures while also upgrading existing research space and developing new research space.

To begin this process, a new research space policy is being implemented in order to maximize the utility of the university’s research space, standardize the allocation and review of research space assignments, and enable enhancement of faculty research productivity and support through sponsored research. Importantly, it is also aimed at enhancing the university’s ability to recruit and retain research-active faculty members. Research space will be assigned with priority given to support for funded research and then to faculty members to develop externally-funded sponsored projects or required for research leading to student terminal degree achievement. Underutilized research space will be re-allocated to support the persisting need for instructional space or be used as research space for new hires, developing new sponsored projects, newly funded work, or research contributing to student degree completion.

### ***Renovation of existing research space***

While implementing this policy aimed at closing the gap with our peers in regards to research space use efficiency and effectiveness, UNT must also improve existing research space to better enable success in competing for both individual and multi-investigator grant awards. For example, UNT will soon complete renovation of the building envelop, mechanical and electrical systems, and a full floor of research laboratories for the Science Research Building in support of growth of the *BioDiscovery Institute of Research Excellence*. This significant investment of resources will bring a renovated suite of laboratories, research support spaces, and office and collaboration spaces up to a level that will attract new hires that will bring grants with them.

### ***New research space***

Improved research space use efficiency and effectiveness, coupled with improved leverage to support greater research expenditures from renovated research space, will support and help retain existing research-active faculty members and help attract the first of the new hires needed to reach our strategic goals. This will therefore contribute to increasing UNT’s restricted research expenditures, enhancing training of the next generation of the regional and national workforce, and increasing the impact, productivity, innovation, and recognition of research at UNT. However, to attract and accommodate, the increased number of research-active faculty

members needed to reach the goals set by our Board of Regents and the state of Texas in restricted research expenditures, new research buildings will be necessary.

Specifically, with constraints imposed by location, synergy, and space quality and suitability, it is estimated that approximately 20 percent of presently allocated research space could be re-allocated from that portion that is underutilized. With renovation where needed, this amounts to approximately 50,000 square feet, enough to support increased sponsored project work by existing faculty as we increase the average size of grants and a significant fraction of the new hires required to reach our goals by 2022. Beyond that, new space will be required for the remaining impact new hires needed to reach the 2025 goal of achieving state of Texas National Research University status.

Given the lead time required to design, finance, and construct a large research building, our strategy is to build mid-scale research or multi-purpose buildings to support areas with high research growth potential while pursuing support to create a marquee research building. For example, in support of UNT's new Biomedical Engineering program, a mid-scale building will be built to house its faculty along with instructional and research space. Other mid-scale laboratory-oriented buildings will be planned in support of high growth research areas. In parallel to construction of these additions to the research space available to support primarily new hires, plans and support for a large, state-of-the-art Science and Technology building will be developed, aimed at attracting and supporting the largest portion of the new hires required to reach the 2022 and 2025 goals for restricted research expenditures.

### ***Outcomes***

By *(i)* improving research space use efficiency and effectiveness, *(ii)* making existing research space more productive and able to attract and retain hires through renovation, *(iii)* construction of mid-scale research building, and ultimately, *(iv)* construction of a marquee science and technology building, the required infrastructure improvements can be achieved to support Actions 1 and 2, growing greater numbers and size of sponsored projects.

### Part III. Plan to Improve Undergraduate Education

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Research, as well as scholarly and creative activities more broadly, by faculty members provides a wide range of opportunities for undergraduate students to gain experience, earn credit towards degree, and prepare for success in graduate school or the workforce. Research is often integral to undergraduate education via, for example, senior capstone experiences, and through opportunities for semester or summer research experience. Therefore, continued plans to strengthen UNT's undergraduate recruitment, support, and education programs work together with the university's research enterprise to enrich student experiences and preparation, as well as to help solidify UNT's Carnegie Tier One status. Actions will be taken to achieve such improvement:

**Action 1.** Tailor recruitment and admissions criteria and processes to meet the rigorous goals of success in degrees broadly, and increasingly in STEM fields,

**Action 2.** Improve student progression rate towards degree and graduate rate, and

**Action 3.** Improve instructional quality and curriculum.

Doing so will result in the following outcomes:

**Outcomes.** Increased enrollment, improved student preparedness for success, improved education and research experience, and greater success of students as graduates, members of the workforce, and citizens.

#### Strategies to improve recruitment, admissions, and financial aid

Undergraduate education is a key element in maintaining and enhancing UNT's standing as a Carnegie Institution Tier One Research University and provides a doorway of opportunity for undergraduate students. The goals and strategies outlined below provide a clear pathway for strengthening UNT's contribution to the economic and social wellbeing of those students, their families and communities, and the state of Texas, as a whole.

UNT's selective admissions criteria allow it to focus on the set of undergraduate students best suited to the rigors and challenges of a Tier One research institution. At the same time, UNT's commitment to opening the doors of opportunity to all citizens of Texas requires that it continually adjust its admissions criteria to achieve a balance between these two goals. It is important to create an undergraduate experience where students are able to quickly engage in the demands of their academic coursework, where they experience a diversity of viewpoints, and where they broaden their ability to be proactively involved in their careers and communities. In response, UNT continually evaluates its admission standards and requirements, increasing its attractiveness to top students, even as it expands its reach to a

diverse student population through outreach and leveraging of targeted scholarship opportunities.

### ***Admissions Criteria and Processes***

UNT has instituted admissions procedures to meet its goals in recruiting a high quality entering freshman class each year. UNT has revised admissions requirements to attract increasingly talented freshmen, by establishing an earlier priority admission application date, reducing admissions of students with lower than desired test scores, and reducing admissions of students with lower than desired class ranks.

### ***Recruitment Strategies***

UNT will target extraordinary and diverse students, by continuing its efforts to provide high quality recruitment information that targets high achieving students and deliver specialized recruitment efforts for top students.

*High quality recruitment information:* Web-based materials and systems will target these students, print publications will reflect the academic rigor and quality of the university to recruit top students, and general university publications will be continually updated and will highlight the Honors College, Texas Academy of Mathematics and Science, and top ranked academic programs and faculty members.

*Recruitment efforts for top students:* Specialized campus tour opportunities, leveraging of search lists to recruit top students well-suited to UNT programs, and technologically appealing self-service tools, personalized online admission information, and other specialized applications.

### ***Leveraging Financial Aid***

UNT will continue to leverage its scholarship programs to appropriately balance financial need and meritorious performance. Present merit scholarship efforts focus on incoming students at the highest academic level as well as student with identified leadership potential. Scholarships for continuing students aim for the twin goals of recognizing outstanding student performance and garnering national recognition for the institution. These include the following:

- Meritorious Scholarship Program – provides fully-funded, renewable scholarships to all National Merit Finalists.
- Terry Scholarship program – provides fully-funded, renewable scholarships to students, including transfer students, based on their record of leadership and academic success.
- Honors College Scholarships – provides scholarships to students in the Honors College.

- Nationally Competitive Awards – students with high potential are mentored through the application and review process for scholarships of national stature including the Goldwater, McNair, and Udall awards.

### **Strategies Related to Progression and Timely Graduation**

Through the leadership of the Provost, UNT has engaged the full academic community in order to focus on two industry-standard measures – progression rate and graduation rate – as it engages with each incoming class of students.

UNT delivers an array of programs designed to increase the progression rate, a necessary condition for increasing the graduation rate. In addition, the academic leadership coordinates campus efforts to impact timely graduation through more effective academic advising (an important contributor to student success, as measured by graduation with the baccalaureate). The goals for progression and graduation for each year of the plan are (i) increase of 0.2 percent per year in the progression rate of first-time, first-year students, (ii) increase of 0.25 percent per year in the four-year graduation rate (through 2019), and (iii) increase of 0.5 percent per year in the six-year graduation rate (through 2019).

To achieve these goals, Institutional Research carries out a predictive progression modeling process using pre-matriculation and survey data. A statistical model has been developed to predict student progression, and the model results are monitored to adjust the advising strategies, student awareness campaigns, and the development and implementation of other programs to increase progression and graduation rates.

### ***Curriculum Improvement Programs***

Student engagement in the classroom is an important component of a quality undergraduate education. The ongoing approach for improving instructional quality through increased student engagement involves an extensive program of faculty support in experiential learning and course redesign. Strategies for quality improvement in undergraduate education include an online student evaluation of teaching and directing resources toward maintaining and eventually improving the student/faculty ratio.

A key, additional element to UNT's focus on enhancing undergraduate education is the initiation of our new Quality Enhancement Program (QEP) – Career Connect. UNT Career Connect promotes university-wide engagement by placing students, faculty, staff, and communities in reciprocal partnerships that promote specific learning outcomes. Career Connect gives students experiences that enhance learning and build communication, critical thinking and teamwork skills - all important qualities desired by employers.

An important resource in the continual improvement of undergraduate instruction is the Center for Learning Enhancement, Assessment, and Redesign. This unit provides course re-design

expertise and general faculty development resources directed at improving instruction, as well as an intensive program to help graduate teaching assistants incorporate strong teaching practices in those areas of the curriculum where they play a significant role.

### ***Closing the Gaps and 60X30TX***

UNT has contributed significantly to the goals set forth in THECB's prior strategic plan, *Closing the Gaps*. In particular, UNT has graduated a significant number of bachelor's degreed individuals in the key fields of education, engineering, computer science, math, physical science, and allied health. UNT has seen significant increases in student enrollment in key areas, particularly in engineering. UNT has also been a leader in developing allied health pathways for students from underrepresented groups. Even with these efforts at expansion, UNT graduates continue to perform very well on certification exams in these areas.

As the leading transfer institution in Texas, UNT has enhanced the ability of Texas students to make successful transitions from community colleges to the university. UNT will continue its support of statewide goals under the new, strategic plan, 60X30TX. UNT is undertaking specific activities in support of each of the major goals of this new plan. These include the following:

- In relation to supporting the achievement of post secondary credentials by 60% of citizens, aged 25-34 in the year 2030, UNT is focusing on increased enrollment and facilitated transfer. UNT is an active and supportive partner in the P-16 Council and has built strong transfer pathways for students.
- In relation to the goal of increasing the number of post-secondary credentials awarded by institutions of higher education in Texas to 550,000 per year by 2030, UNT is continuing to press for increased enrollments and improvements in both progression and graduation rates.
- In relation to assuring that students graduate with clearly identified marketable skills, UNT has focused its QEP on helping students see the "Career Connect" between their undergraduate work and their future careers. Each undergraduate academic program will have identified marketable skills that are clearly communicated to students.
- In relation to the goal of holding student debt in check, UNT has worked to refine and target its financial aid processes and build clear pathways to help students graduate with fewer excess hours.

## Part IV. Plan for Doctoral Programs

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As with any highly active research university, graduate education is integral to, and mutually supportive of, the research enterprise. Graduate students benefit in essential ways from education delivered by highly research successful faculty and from participation in research as an integral part of their degree work. Their success after graduation as part of the technical workforce in industry, government laboratories, and academe, not to mention their contributions as intellectually honed citizens, is in large part dependent on these educational and research opportunities. In turn, graduate students comprise an essential part of the research teams alongside faculty members, research scientists, postdoctoral scholars, and collaborators at other institutions. As such, they are often supported by graduate research assistantships and therefore benefit and contribute directly from faculty success in sponsored projects.

Consequently, continuing to strengthen doctoral programs at UNT very much strengthens the means to greater research success. Actions planned to do this include the following:

**Action 1.** Improve recruitment, admissions standards, and processes for graduate programs,

**Action 2.** Expand support for graduate assistantships, and

**Action 3.** Improve graduate rates and the quality of graduate education and research experience.

The expected outcomes will be:

**Outcomes.** Increased numbers and preparedness of graduate students, more timely graduation, greater success of research experience and contribution to research activities, and greater success entering the technical, academic, industrial, and government laboratory workforce.

### Existing programs

UNT continues to lead the region and rank among the state's top universities for the number of doctoral degrees it awards annually. UNT offers 83 master's and 37 doctoral degree programs with more being developed for Fall 2017. Many of UNT's master's degrees, which have no doctoral degree in the area, have research components where they work closely with faculty members. Many of these students stay on to enter doctoral programs in other areas. The doctoral degrees offered by UNT reflect our strong tradition in teacher education, international acclaim in the performing arts, dedication to the humanities, and an increasing focus on STEM research.

One of UNT's goals is to "provide superior graduate education, scholarship, and artistic endeavors and achieve status among the nation's tier-one research institutions." To accomplish this, UNT must be able to strengthen graduate education, especially doctoral programs. This involves not only awarding more doctoral degrees, but also strengthening the programs to a level of national prominence. Therefore, UNT has increased funding significantly over the past five years to enhance our graduate programs. In the last three years, UNT has invested new funding of more than \$6 million to increase graduate student support across the university. Stipends, travel grants and tuition funding have more than doubled and new doctoral lines are added each year. These investments are aimed at meeting our research goals and recruit, retain, and graduate the next generation of scholars, innovators, and entrepreneurs.

### ***Doctoral degree inventory***

The THECB Program Inventory lists the following number of doctoral programs offered at the University of North Texas: Doctor of Audiology (1 degree offered), Doctor of Education (2), Doctor of Musical Arts (1), and Doctor of Philosophy (3). Overall, doctoral enrollment has increased 7.8 percent from 2010 to 2016. We expect enrollment to continue to increase based on the rounded average change in enrollment for each department since Fall 2010. These figures represent the estimated capacity of departments to recruit students moving forward based on past performance. Also considered in these projections are the number of new graduate student budget lines that have been allocated to begin Fall 2017, and the total number of new graduate student lines anticipated by 2021. However, actual enrollment will vary based on the needs of the market and changes in the priorities of the university.

### ***Graduation rate***

While UNT awards many doctoral degrees each year, our 10-year doctoral graduation rates are a focus area for future improvement.

The minimum 10-year graduation rate requirement for National Research University (NRU) status is 58 percent for doctoral students. While UNT's master's 5-year graduation rate far exceeds the NRU standards and the doctoral rate has improved over the last few years, the goal is to not only increase, but also exceed the minimum NRU doctoral 10-year graduation rate within the next five years.

### ***Assessment***

The systematic review of all graduate degree programs is necessary to assure academic excellence and provide data for long-range planning. The university process for Academic Program Review (APR) requires all academic units, regardless of discipline-specific accreditation by outside agencies, to submit an APR every seven years. This review gives each unit an excellent opportunity to assess its mission, strengths, and challenges. In addition, the unit can evaluate its curriculum, operation, and resources relative to the university's mission and strategic priorities.

Improvements and reputational increases of doctoral programs have been made in all programs reviewed. In FY 2015-16, one of the recommendations to the Counseling and Higher Education doctoral program was to offer additional guidance to students in choosing between the Ph.D. and the Ed.D. programs. Faculty responded quickly, and clearly wrote information to help students differentiate between the two programs. Then they posted the information on the college web site, which can now be found at [www.coe.unt.edu/counseling-and-higher-education/higher-education-programs](http://www.coe.unt.edu/counseling-and-higher-education/higher-education-programs).

Besides the program reviews, UNT evaluates the strength and weakness of doctoral programs by using THECB 18 Characteristics of Doctoral Programs and national rankings, among other criteria. Data from 2012 to 2015 shows that UNT has several high producing doctoral programs that award on average more than 10 degrees per year over a three-year period. These strong programs include Chemistry, Computer Science and Engineering, Information Science, and Music Performance. The high-producing programs help contribute to UNT's excellent overall standing in the region and state in awarding doctoral degrees. UNT has also been diligent since 2010 to improve, close, or consolidate low-producing doctoral programs.

### **New doctoral programs**

UNT has developed several new Ph.D. programs, refocused and rebranded others, and created concentrations within existing doctoral programs to be more nimble in addressing market needs and build upon our existing strengths. These programs either have just started enrolling students or plan to enroll students in Fall 2017 or later. In particular, two new doctoral engineering degrees have been developed in the last five years – electrical engineering and mechanical and energy engineering. New concentrations have been planned in Data Science (College of Information, COI), Linguistics (COI), Audiology and Speech Language Pathology, (College of Public Administration and Community Service, PACS), Rehabilitation (PACS), and Biomedical Engineering (Department of Electrical Engineering). Changes made have been in response to the demands of student, industry national labs, and academic institutions, as well as in support of enhanced research success at UNT.

### **Regional impact**

Developing and offering doctoral programs is integral to our strategic research objectives. Continuous examination of market demands and existing programs allows UNT to create, refocus, rename, or consolidate programs to address market needs in the region, state, and nation. Continuing to monitor programs through Academic Program Reviews, staying abreast of enrollment gains and declines, and quickly responding to employment needs and trends allow UNT to access the impact of any new and existing doctoral program.

UNT's status as one of the largest universities in Texas, a Carnegie Tier One Research University, and its location in the Dallas-Fort Worth metropolitan area, home to an abundance of jobs, internship opportunities, and a diverse culture, are reasons graduate education and research are essential to the future vitality of the university and the region.

## Part V. Other Resources

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In addition to our overarching plan for research funding and productivity, and plans to improve undergraduate education and doctoral programs, other resources complement these central pillars of the research enterprise at UNT. These include vibrant existing and developing efforts in (i) philanthropic support for research, (ii) technology transfer, commercialization, and economic development, (iii) libraries, (iv) research space, (v) intramural research grants and awards, (vi) enhancements of undergraduate research, and (vii) student body diversity.

### Philanthropic support of research

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Philanthropic gifts promote student success through scholarships and fellowships, support athletics, advance research and scholarly activities, and fuel creativity through art and music. UNT's Division of Advancement is responsible for developing donor relationships, soliciting contributions, and providing stewardship of gifts. The UNT Foundation works closely with Advancement by providing financial and investment management of the endowment. Therefore Advancement and the Foundation will play important and integrals roles in increasing support for research and building national visibility. Specific actions will include:

**Action 1.** Market research opportunities to donors, seeding research initiatives, and cultivating and supporting multi-investigator teams seeking support from foundations, and

**Action 2.** Seek to maximize state of Texas and other matches for gifts, and enhance UNT's reputation with donors, foundations, and businesses, to cultivate greater gift support for research.

We expect these actions to result in a significant enhancement of research.

**Outcomes.** Seek an increase in the number of endowed professorial chairs, student scholarships and fellowships, philanthropic funds for research work and equipment, and greater support for research and scholarly activities from foundations.

### Marketing, supporting, and seeding research

The Division of Advancement will continue to develop opportunities for donors to support research at UNT by providing endowed professorial chairs, fellowships and scholarships for research students, and expendable funds for research activities and equipment. For example,

recent efforts have resulted in several new endowed chairs and a major gift to support the *Jim McNatt Institute for Logistics Research*.

Advancement will launch an annual giving initiative, the Venture Philanthropy Fund, which will be a source of seed funding for research initiatives, complementing UNT's new Diamond Eagles Fund that encourages gifts of \$1,000 for which donor members of the fund vote to choose from proposed impactful small initiatives. Also planned is continued efforts by Advancement to help attract top undergraduate students to UNT, which increases the number and preparedness of undergraduate students participating in research. National Merit Scholar fundraising has resulted in \$1,100,000 in present funds to help UNT be more competitive in recruiting these students.

### **Foundation and industrial relationships**

Potential sources of support for research growth that have remained relatively untapped are foundations and industries. Advancement will seek to identify collaborative research teams that focus on work with direct industrial or societal impact to match with potential support opportunities. Recent examples of this approach include further enhancement of the UNT Kristin Farmer Autism Center and pursuit of support for the Criminal Justice program.

As with grants from federal agencies, gifts from foundations and industries that reach the million dollar scale frequently require large, multi-investigator, multi-disciplinary teams. Therefore, particular emphasis will be placed on seeking opportunities, for example, using the strengths of UNT's *Institutes of Research Excellence* and other centers. Advancement will also seek to mentor faculty members because of the differences in foundation and industry interests, processes, and objectives that are not analogous to the more familiar aims and procedures they encounter in seeking federal or state agency funding.

### **Maximizing gift matches**

While increasing pursuit of foundation and industrial gifts to support research, Advancement will continue to concomitantly increase pursuit of matches for such gifts through the Texas Research Incentive Program (TRIP) when eligible to do so. This has begun through efforts to increase awareness among faculty members of both philanthropic opportunities and TRIP-eligible matching through a new electronic newsletter, presentations by Advancement at academic department meetings, screening for match eligibility upon proposal submissions, and outreach to individual investigators by Advancement officers.

Already such efforts have resulted in almost a tripling of the dollar value of TRIP matched grants from FY13-14 to FY15-16. In addition, Advancement offices now routinely offer the opportunity

to utilize TRIP matching when donors support graduate fellowships to aid their research participation and experience.

### **Analysis of data and planning**

Efforts to increase support for research through philanthropic sources will also benefit from implementation of new mechanisms to track such gifts, to utilize data to establish specific goals, and to develop more opportunities to match research projects with donors.

Advancement will also more frequently review existing planned gifts, especially bequests, to communicate to donors the advantages supporting research initiatives that are TRIP eligible. A recent example of such benefit was the revision of an existing twelve million dollar bequest to include five million dollars that will now support fellowships and research.

### **Technology Transfer, Commercialization, and Economic Development**

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In addition to the outputs of UNT's research enterprise that represent scholarly works (such as journal articles) or deliverables to sponsors, opportunities arise for making innovations in processes and technology available more broadly. Such avenues include pursuit of patents and bringing the intellectual property to commercial application through licensing. These technology transfer and commercialization aspects of research benefit the faculty and students involved directly, enrich the scope of opportunities to develop new sponsored projects, increase the visibility of UNT's research enterprise, and can ideally provide net income to reinvest developing research. Beyond these activities, UNT's research enterprise provides an important contribution to regional economic development through partnerships with public entities such as regional cities, businesses, and the community.

Therefore, to further research success and its impact, we plan to take the following actions:

**Action 1.** Improve infrastructure needed to capture intellectual property and to bring benefits for faculty, students, the university, and the broader community,

**Action 2.** Take steps to develop entrepreneurship among the faculty and student body, and

**Action 3.** Expand the number and depth of UNT's research-driven partnerships to further regional and national economic development opportunities.

The outcomes expected from taking these actions will be the following:

**Outcome 1.** An increased number of patents issued and licenses executed, with a synergistic enhancement of sponsored projects that generate intellectual property,

**Outcome 2.** An increase in the number and level of benefit of entrepreneurial opportunities for students and faculty, and

**Outcome 3.** A larger and broader connection of UNT's research enterprise with the local and regional economy.

### **Enhancing “innovation” activities**

To develop the required staff, provide experienced leadership, and to focus efforts on improving and expanding technology transfer, commercialization, and entrepreneurship – broadly termed “innovation” - an Associate Vice President has been hired to lead the newly established Office of Innovation and Commercialization. As the staffing of this office is put in place, implementation of a knowledge management system has been accomplished. The system is used to catalog all past and future activities in identifying, capturing, and licensing of intellectual property, bringing this facet of operations of the university's research enterprise more in line with peer best practices.

Invigorated efforts have also begun to identify intellectual property developed by faculty and to work towards commercialization of those developments. As an early example of success, 35 new disclosures have been filed, one license completed, and five licenses are in negotiation within the first year of operation of this new office, a significant increase over previous years. The goal will be to continue to increase the number of disclosures, patents issued, and licenses executed over the next five years to achieve results on par with our peer research universities.

In addition, the Office of Innovation and Commercialization has provided support for processing and administering contracts and grants that involve intellectual property issues, as well as for confidentiality agreements and material transfer agreements. These services significantly augment support and expertise previously available, providing faster and more expert service supporting sponsored projects.

### **Entrepreneurship**

Recognizing the benefit to students several of UNT's Colleges have developed programs aimed at providing varying levels and types of entrepreneurial experience. Leading these, the College of Business offers a degree in entrepreneurship and hosts a center for entrepreneurship that provides, for example, “Entrepreneur's Boot Camp” and the New Venture Creation Competition. Students may also pursue opportunities to gain experience working on practical problems that can spur entrepreneurship, for example, through the College of Engineering's “Senior Design” program for which some projects are supported by, and closely partner with, local industries.

To augment these opportunities, particularly aimed at supporting and developing opportunities stemming from UNT's research activities, the Office of Innovation and Commercialization has begun providing entrepreneurial mentoring services free to students, and will greatly expand these activities with the launch of UNT's "*Collab Lab*", a space to be created for students, faculty, and community members to innovate together. Through the *Collab Lab*, mentoring for student entrepreneurs will be provided as well as short, certificate-style programs designed to provide the foundational expertise students will need for their careers, including use of management information systems and analytical tools for business and overviews of relevant legal and sales development topics, for example.

### **Economic development**

As a research university, UNT contributes to the economic development of the region through a number of avenues. Examples include its expenditures within the local community that support research and development, providing technical expertise to public and private entities, and executing licenses based on patented technologies. In addition, important contributions are made through development of the workforce and execution of sponsored research agreements with the private sector (including, for example, Small Business Innovation Research programs, Industry-University Cooperative Research Centers, and NSF's Innovation Corps).

In addition, UNT broadly and the *Institutes* in particular, work towards developing partnerships with the public and private for-profit and not-for-profit sectors. Examples include partnerships with Lockheed Martin, Lubrizol, PepsiCo, Sally Beauty, and a large number of companies based at Fort Worth Alliance Airport. UNT also works closely with the Frisco Economic Development Corporation, the Denton Economic Development Partnership and numerous regional Chambers of Commerce (for example, the Denton, Grater Dall, Southlake, and Frisco Chambers).

By strengthening and growing UNT's economic development activities, the impact and visibility of UNT as a major contributor to the economic engine of the region will grow. We will continue to significantly enhance the economy and build an important "high tech" workforce, a workforce that commands higher salaries, and contributes more significantly to economic output and the tax base for the region. UNT aspires to be known regionally and nationally for its growing innovation culture, and to increase its reputation and value based on its growing research enterprise through such workforce, technology, and service contributions.

### **Launching the UNT Research Foundation**

Over the next year, UNT intends to launch a not-for-profit Research Foundation in order to further our goals in technology transfer, commercialization, and economic development. The Research Foundation will facilitate patent applications for UNT-developed technologies, execute licenses of these technologies with private sector companies, and serve as the holder

of equity as part of these agreements. It will also assist with the launching of start-up companies, encourage involvement in public-private partnerships, and negotiate real estate transactions based on UNT research, commercialization, or economic development potential as well as for other appropriate activities supporting these areas.

## Library resources

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Supporting innovation and learning for the entire university community, the UNT Libraries are an essential force in teaching and research, and work to meet the ever-changing needs of a vibrant, student-centered research university. Consequently, our plan for library support of research will be centered on the following actions:

**Action 1.** Continued and expanded support for student research experience and faculty scholarly and research activities, and

**Action 2.** Promotion of new technologies and modalities that enhance student and faculty research.

These actions will be aimed at achieving the desired outcomes:

**Outcome 1.** Greater access to and utility of library resources for students pursuing degrees and faculty and students performing research, and

**Outcome 2.** Enhanced national recognition and leadership in library science, technology, and service for student and faculty research.

## Goals for UNT libraries

The UNT Libraries ([www.library.unt.edu](http://www.library.unt.edu)) provide access to comprehensive information resources and services in support of the degree programs and educational activities undertaken by students and faculty members. As the most-used service on campus and an essential component of education and research at UNT, the Libraries offer access to more than 6 million print and digital items. The Libraries also provide innovative programs and support services as well as expert personnel to assist patrons in achieving their academic and scholarly goals. By prioritizing activities and use of space with regard to demonstrable impact on learning, research, knowledge creation, and academic success, the Libraries regularly strive to create and provide facilities and access to information resources that advance learning and enable knowledge creation. To do this the libraries structure activities around collaboration rather than transactional behavior and shape this collaboration so that the library is a catalyst for academic success. It is essential that library resources be ubiquitously present to readers in both their physical and virtual learning environments.

## **Supporting and partnering**

Staff in the libraries have been able to develop research partnerships with research and classroom faculty to advance learning and enable knowledge creation. The libraries focus instructional activities on developing the skills students need to use information resources effectively in learning, critical thinking, knowledge creation, and, moreover, lifelong learning.

Library collections, services, facilities, and collaboration with faculty all contribute directly to supporting existing and new doctoral research programs. Doctoral level research requires access to comprehensive and deep information resources in the form of collections of scholarly publications and primary research material. The range of doctoral programs at UNT is broad, requiring wide-ranging monographic and serial collections across the humanities, social sciences, pure and applied sciences disciplines in which graduate students may pursue doctorates. Moreover, access to comprehensive digital information resources and services is now a critical underpinning of doctoral research in all fields, from the most current scientific and engineering findings to digitized archives of primary research materials.

As UNT adds doctoral programs in new disciplines, the library continues to expand its collection development and reference programs to meet the needs of new graduate students. The collection development division of the libraries engages in proactive analysis of how to best meet the needs of new doctoral research programs, and uses a variety of assessment techniques for strategically identifying collecting areas in support of new programs. This is part of the larger assessment effort within the libraries, which aims at continuous improvement of library resources and services.

## **Leading new developments**

The libraries are active in many national and international efforts to promote open access and digital preservation policies for scholarship. The UNT Libraries are members of the Association of Research Libraries Scholarly Publishing and Academic Resources Coalition (SPARC) and the International Internet Preservation Consortium (IIPC). The UNT Libraries foster open access policies and sustain digital preservation of research information by organizing major events and undertaking collaborative projects in these areas involving faculty, the libraries, other campus groups, and other partner research institutions. For example the UNT Libraries led the implementation of the campus Open Access Policy (UNT Policy number 06.041 ([policy.unt.edu/policy/06-041](http://policy.unt.edu/policy/06-041)), the first such OA policy adopted by a public university in Texas.

The UNT Libraries are leaders in the creation of digital information resources. The UNT *Digital Library* is home to materials from the University's research, creative, and scholarly activities, and also showcases content from the UNT Libraries' collections. Materials include theses, dissertations, artwork, performances, musical scores, journals, government documents, rare books, and historical posters. Created and maintained by the University of North Texas

Libraries, the *Portal to Texas History* ([texashistory.unt.edu](http://texashistory.unt.edu)) is a gateway to rare, historical, and primary source materials from or about Texas. The Portal leverages the power of hundreds of content partners across the state to provide a vibrant, growing collection of resources.

## Research space

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Carrying out ongoing research, having the ability to attract new hires, and growing research volume and impact, requires appropriate and sufficient state-of-the-art research space. At present, UNT has approximately 230,000 square feet of space reported to the THECB as research space, almost exactly equal to the average utilized by the six Texas-designated emerging research universities (UTA, UTD, UTSA, UTEP, TX State, UNT), and about one half of that of the two universities that have recently achieved Texas-designated national research university fund state (TX Tech and U of Houston).

The vast majority of UNT's research space is located either on the main campus in Denton, for example in the Department of Biological Sciences, Chemistry, and Physics, and at UNT's Discovery Park, which houses the Colleges of Engineering and Information. Much of the research space at Discovery Park and a portion of it on main campus is modern, having been constructed or renovated in the last ten years, but much of it, particularly on main campus, is in need of renovation to be able to attract new faculty that can bring funding with them or to enable significant new funding for existing faculty members.

As highlighted in above in **Plan for Research Funding and Productivity**, UNT's use of research space is not as efficient or effective as that of our Texas research university peers. Therefore as described in Section II, our planned action and expected outcome are as follows:

**Action.** Increase the efficiency of research space utilization, the quality of existing research space, and the total amount of research space available, and

**Outcome.** Attract and retain hires through renovation, mid-scale research building construction, and through creation, ultimately, of a marquee science and technology building, to support greater numbers and total size of sponsored projects.

Therefore plans have been developed to (i) reclaim space that is underutilized (i.e., not sufficiently contributing to support of sponsored projects, to develop sponsored projects, or to support achievement of students' terminal degree), (ii) renovate existing and reclaimed research space, and (iii) build more state-of-the-art research space. These actions are aimed at enabling greater numbers and size of sponsored projects and attracting new hires with funding. Examples of such actions already underway include renovation of UNT's Science Research Building, enabling an expansion including new hires for the *BioDiscovery Institute*, and planned

construction of a Biomedical Research building to house UNT's College of Engineering's newest department.

### **Intramural research grants and awards**

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In addition to providing research space, faculty lines, and research infrastructure, the University helps to enable continued growth of research success through several programs of intramural grants and awards. These are aimed at providing “seed” funding for ideas that clearly identify the opportunity for follow-on funding and recognize and thereby promote achievement in research, and more broadly, scholarly and creative activities. Examples of these include the Office of Research and Innovation's Research Seed Grants and Innovator Awards, the Provost's naming of Distinguished Research Faculty members and China and India Venture Funds, and UNT Foundation's Eminent Faculty Award. Complementing these grants and awards are similar recognitions and support for the University's other vital missions in teaching and service. Thus, planned action and accompanying expected outcome are as follows:

**Action.** Grow research success by judicious funding of high-return-on-investment projects that seed follow-on sponsored projects and recognize faculty, students, and staff that make significant contributions to research, and

**Outcome.** Increased number and size of sponsored projects and broad range and scope of achievement of all members of the UNT research community.

### **Honors College plans to enhance undergraduate research**

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Undergraduate research experiences nurture the next generation of researchers and scholars. This is an important component in preparing for successful graduate admissions and graduate program completion. Further, systematic investigations into natural and social phenomena provide students with disciplined approaches to defining and solving problems. Thus, students acquire an important skill set for the complex 21<sup>st</sup> Century world and workplace.

UNT's Honors College plays a large role in enhancing undergraduate education through research experience. Initiatives include the Honors Program, the McNair Scholars Program, the Texas Academy of Mathematics and Science (TAMS), the Undergraduate Research Fellowship, and Career Connect and Research Connect. Building on these programs, the Honors College will focus on the following actions:

**Action 1.** Enhance the undergraduate student learning experience through undergraduate research, and

**Action 2.** Promote student retention and prepare students for post-baccalaureate work and life.

Results of these actions will be the following outcomes:

**Outcome 1.** Raising the GPAs of students engaged in undergraduate research, as measured by transcript assessment and self-evaluation, and

**Outcome 2.** Improved retention of students, as measured by tracking of students engaged in research, and (relative to work and life), as measured by tracking of post-graduate success.

### **Honors College program**

The Honors College creates and supports learning opportunities for talented students who seek to excel academically and thrive personally. A number of its activities are aimed directly at building undergraduate research and scholarly experience. For example, Honors College supports the undergraduate scholarly journal *The Eagle Feather*, Honors College Book publishing for undergraduate essays, Scholars Day celebrating the work of undergraduates in research, and the Office of Nationally Competitive Scholarships that identifies external scholarships and fellowships and mentoring students through the application process.

In addition, the Honors College has implemented a Research Track option in order to incentivize undergraduate research, via the production of an Honors thesis, for students interested in conducting research in a specific field of study (not necessarily in their major) and reaching the highest level of distinction in Honors. The Research Track seeks to prepare Honors College students for academic research by providing research courses, faculty mentoring, opportunities for presentations and publication, hands-on research experience, and funding for travel to professional meetings.

### **McNair Scholars program**

The U.S. Department of Education has funded The Ronald E. McNair Postbaccalaureate Achievement Program at UNT since the early 1990s. Its purpose is to prepare undergraduate students for graduate studies and to pursue a Ph.D. A fundamental component of all McNair Scholars Programs is intensive research experiences with faculty mentors. The research results in posters, papers, and oral presentations by the Scholars at regional and national conferences. The focus is to enhance the undergraduate experience of low-income and first-generation college students or students who are members of groups under-represented in graduate studies. One intended outcome is to have the scholars complete their bachelor degree successfully and enroll in a graduate program shortly thereafter. UNT faculty mentors guide

their undergraduate mentees and socialize them into the culture of research and scholarly work.

The Honors College will submit a competitive grant proposal in spring 2017 to secure another five years of funding for the UNT McNair Scholars Program. With success of the proposal, the Honors College will increase and improve program services to McNair Scholars related to GPA, GRE scores, and retention in graduate programs. In collaboration with the Office of Nationally Competitive Scholarships, all McNair Scholars will submit at least one application for graduate school funding.

In addition, Honors College will establish the “undergraduate researcher pipeline.” The pipeline will use various workshops, classes, tutorials, and other interventions to build research capacity of undergraduates to be successful in McNair, Undergraduate Research Fellowships, and all other undergraduate research opportunities.

### **Texas Academy of Mathematics and Science**

Considered by many to be the nation’s premier early-admissions college program in STEM areas, TAMS promulgates a culture of undergraduate research and publication that has in large measure inspired the more general undergraduate research opportunities. Alumni from TAMS have become leading figures in their fields of study and research professors at a host of universities. Specifically, TAMS is a two-year program (grades 11 & 12) for high-ability students considering STEM careers. Students pay no tuition, book costs, or fees for fall and spring semester classes. After two years, students will have earned 57 or more college credits and may continue their education at UNT, or transfer to other universities in state or out, usually at advanced standing.

In addition, students in TAMS compete for 10-week Summer Research Scholarships (\$3000) to fund STEM engagement. Students’ summer research projects serve as the basis for publications and successful outcomes for national scholarships and competitions. TAMS students have earned the majority of Goldwater scholarships at UNT. Also, TAMS has the second largest number of regional finalists for the Siemens Competition, largely because of \$250,000 in undergraduate research scholarships.

In a pilot program launched in the summer of 2016, incoming TAMS students compete for up to six Early Research Scholarships (\$3000) to fund ten weeks of residential- and on-campus research and study. We bring these soon-to-be freshmen to our campus two months early, immersing them in advanced research labs of distinguished scientists. These students continue their research during the academic year, and are strong candidates for TAMS research scholarships the following summer, thus increasing their productivity and competitiveness.

## **The Undergraduate Research Fellowship (URF)**

Beginning in 2016, the URF initiative provides grants to departments to operate undergraduate research programs, pairing faculty members with talented undergraduates, to enhance academic excellence via the expansion of mentor-based undergraduate research across all disciplines and their curricula. The Offices of the President, Provost, Vice President for Finance and Administration, and Vice President for Research and Innovation - in collaboration with the Dean of TAMS and the Honors College - collectively pledged \$125,000 for up to 250 URFs, each funded at \$500.

These fellowships reward students who show promise of significantly contributing to faculty-led research and scholarly pursuits. The program seeks to encourage a dramatic increase in the number of students, broadly across the university, who engage in faculty-mentored research and beyond-the-classroom creative projects. Students can use their classroom learning as points of departure for guided research and enhanced productivity. This initiative is likely to increase the number of nationally competitive awards garnered by UNT students, inasmuch as many national and international foundations and commissions increasingly look to the original scholarly or scientific contributions of undergraduates.

## **Career Connect, Research Connect**

Career Connect experiences give students the opportunity to work with a community partner towards a mutually beneficial goal. Connect experiences include internships, volunteer work, research projects, study abroad trips, etc. Once students complete a Connect experience, their skills are evaluated and then they get the chance to write a reflection to help understand the skills they're building - all to prepare them for future job interviews, career fairs and their professional life. Career Connect is the University's quality enhancement plan (QEP), which is a five-year plan required by our accrediting agency, Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). UNT launched this plan with the notification in December 2016 of its successful ten-year accreditation by SACSCOC.

Just as Career Connect is aimed at connecting students with meaningful opportunities to build career enhancing skills and experience, Research Connect, is an initiative launching in 2017, aiming to connect students with research mentors. In this new program, the Office of Research and Innovation will compile faculty research interests (also beneficial for connecting faculty members with funding announcements) to facilitate students making contact with potential faculty members who can mentor them in research experiences.

## Development of a Diverse Student Body

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Growing opportunities for research experience and careers for students of a diverse background is both a goal for UNT's research enterprise and a benefit to it. Reflective of present state-wide demographics and sustained efforts to promote advancement of a diverse student body, approximately 50 percent of UNT's students come from traditionally underrepresented groups. This is a result of recruitment efforts at both the undergraduate and graduate levels. The planned action will continue to support UNT's diverse community:

**Action.** Value and promote diversity at UNT, and

**Outcome.** Preserve and grow UNT's ethnically-diverse college campuses that offer students the opportunity to study and collaborate with students, faculty, and staff from racial and ethnic groups that are different from their own.

### Examples of UNT's efforts to recruit a diverse student body

- UNT-Howard Hughes Medical Institute Undergraduate Researchers Program seeks out underrepresented students and encourages them to excel in research environments.
- UNT's Terry Scholars Program recruits high-achieving students with unmet financial need and provides them with the means to accomplish great things. These students, reflecting a diversity of backgrounds, enter UNT as either freshmen or as transfer students. Many of the transfer students are non-conventional students.
- One direct recruiting activity includes the annual Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) national conference. This conference offers the opportunity to speak directly with high achieving students in STEM areas and recruit them to UNT.
- Another recruiting opportunity for recruiting underrepresented students resides in the UNT Ronald E. McNair Post-baccalaureate Achievement Program, the students of which prepare to enter doctoral programs. Regional and national McNair conferences encourage graduate-level recruitment of McNair seniors.
- TAMS, one of the programs with a large number of undergraduate researchers, has recently hired a recruiter with a significant focus in increasing representation of groups and locations that are under-represented in TAMS and in STEM fields. Additionally, in order to assist under-privileged students, TAMS started a bridge program in the summer of 2016, with the intent of increasing those students' preparation for rigorous courses,

thus enhancing the chances that they will liberate time to conduct research. Underrepresented and other alumni also are recruited as interviewers to help evaluate the suitability TAMS applicants, adding their unique sensitivities and perspectives to the process.

- Utilizing such recruiting techniques as National Name Exchange and other purchased lists will result in locating students who will enhance UNT's progress toward *Closing the Gaps*. The Lone Star Diversity Colloquium is another recruiting opportunity developed especially for Texas institutions to educate certain groups about the opportunities in graduate education. UNT annually participates in all of these recruiting events.
- Competitive funding packages are a key element in recruiting top students to UNT. By providing assistantships and scholarships in key disciplines, recruitment becomes more flexible. Thus, programs are able to obtain commitments from college recruits. Continuing such investment is key to success in UNT's success in moving forward with national research university status. Continual review of recruiting strategies will result in broadening opportunities for recruitment of underrepresented students.

## Part VI. National Visibility

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Complementing UNT's nationally recognized programs in music, business, design and art, humanities, public service, and education, strengths and national reputation are emerging and growing in plant biology, materials science and engineering, computational sciences and informatics/analytics, and chemical sciences, for example. Actions planned will continue to increase our national visibility in research while growing research success.

**Action 1.** Focus investment in *Institutes of Research Excellence* to enable multi-investigator, multi-disciplinary, and multi-institutional sponsored projects, balanced with investment in the broad range of areas needed to deliver region-leading education, continued broad research success, and work forces development.

**Action 2.** Grow the capabilities and scope of shared research facilities to support the *Institutes* and broader range of research.

**Action 3.** Create partnerships with national laboratories and other research universities to leverage opportunities for larger, more impactful, and more visible sponsored projects.

These actions will lead to the outcomes we seek in national rankings and scope of research success.

**Outcomes.** Greater national visibility measured by rankings such as the National Science Foundation's Higher Education Research and Development Survey, numbers of National Academy members and highly ranked faculty members within their professional societies, and more STEM and other research active departments ranked within the top 100 or higher.

### Institutes of Research Excellence

Launching four *Institutes of Research Excellence*, and seeding their initial operation through intramural and philanthropic support, has been aimed at creating synergies and critical numbers of researchers to enable significantly larger, more visible, and more impactful sponsored projects. The *Institutes* will be focal points, building on intrinsic strengths, around which to create a "critical mass" of active researchers necessary to solidify UNT's Carnegie Institution designation as Tier One Research University.

The faculty members who form the basis of the *Institutes* have considerable external visibility, good to excellent track records in attracting external funding, wide and deep industry contacts, and significant potential for interdisciplinary research. However, they have been constrained by limitations of research space and work within a traditional departmental academic culture that

can inhibit seeking and carrying out large funded projects, promoting innovation, and engaging in interdisciplinary activities (for a national perspective, see the National Research Council report *Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond* (2014)).

### ***The Advanced Environmental Research Institute (AERI)***

*AERI* has been established in recognition of the UNT's strong and growing environmental and water research program. It is comprised of members that form a multidisciplinary team committed to collaborating on large research projects with an emphasis on finding solutions for challenges facing public and private organizations within the region, nation, and world. In particular, *AERI* will seek understanding of how human actions impact the environment, and then using that knowledge suggest scientific, engineering, policy, and/or education solutions to actual environmental problems. Therefore, *AERI*'s overarching goal is to seek to benefit society's health and welfare through wise decisions concerning our environment. Areas of focus include air quality, water quality, water resource management, toxicology, climate change, land use, remote sensing, ecosystems and conversation, and the relevant health and economics issues influencing such environmental areas.

In particular, *AERI* scholars have wide interests and are currently funded to examine a broad range of environmental issues from the status of agricultural pollinators in Texas, to the surveillance of mosquitoes for West Nile Virus, to disaster response planning for infectious diseases, to determining the level of persistent chemicals in ecosystems. Research underway in *AERI* encompasses basic science questions (e.g. effectiveness of blood-brain barriers in mammals), environmental technology (e.g. sustainable autonomous desalination plants), applications of science to real world problems (e.g. wetlands restoration), and environmental science education and outreach (STEM curriculum for the Dallas Independent School District). *AERI* has strategic partnerships with both the private and governmental sectors, and assists both in answering targeted questions about the human/natural environment interface.

As an example of *AERI*'s activities, through a partnership with Lewisville, Texas, one of *AERI*'s important real-world environments for both study and education is the Lewisville Lake Environmental Learning Area (LLELA). To the south of Lewisville Lake, LLELA is a 2,100 acre preserve below the Lewisville Lake dam that serves as a living laboratory and provides opportunities for hands-on training encompassing its prairieland, array of animals and diversity of waterways. The Lewisville Aquatic Ecosystems Facility, one of the many laboratories located within LLELA (administered by the U.S. Army Corps of Engineers) offers the opportunity for research that will help to preserve, manage, and restore ecosystems in Texas lakes and rivers.

### ***The Advanced Materials and Manufacturing Institute (AMMPI)***

Current *AMMPI* members also have national recognition for their research expertise in structural materials, multi-functional materials, advanced manufacturing, materials physics and chemistry, and advanced characterization. They will develop strategic partnerships with

industries to bring new materials-based products to the marketplace, and will develop and submit proposals to large, multi-investigator, trans-disciplinary grant programs (e.g., the NSF Multiscale Systems Engineering Center program).

*AMMPI* members will apply their expertise in areas of advanced materials and manufacturing with relevance to the defense, aerospace, and energy sectors. They will deliver research solutions involving (i) the development and maturation of advanced materials for additive manufacturing, (ii) novel hybrid manufacturing processes based on laser and friction stir processing, (iii) development of corrosion-resistant materials and coatings, (iv) far-from-equilibrium materials including complex concentrated alloys, two-dimensional materials, and (v) sustainable organic sensitizers and photonic crystals.

As with the *BDI*, *AMMPI*'s organizational structure will promote extensive inter-disciplinary collaborations between these focus areas, supported by dedicated core facilities.

### ***The BioDiscovery Institute (BDI)***

The *BDI* aims to be a world leader in the basic understanding of plant processes with application for the future bio-based economy, and extending beyond plants to the microbial and biomedical fields. Current *BDI* members bring to the institute nationally recognized research expertise in plant biology, genomics, metabolomics, synthetic biology, and materials science.

As such, they represent a unique association of plant, materials, computer science, engineering, analytical chemistry, and business expertise that will enable the *BDI* to deliver research solutions to underpin the utilization of plants for production of biopolymers, new construction materials, bioactive small molecules with applications in healthcare including the cosmetics and nutraceutical industries, agriculture, and biofuels.

The organizational structure of the institute will promote extensive inter-disciplinary collaborations between these focus areas, supported by dedicated core facilities. The *BDI* will develop strategic partnerships with industries to bring new bio-based products to the marketplace.

### ***The Jim McNatt Institute (JMI) for Logistics Research***

The *JMI* leverages strengths and capabilities across multiple disciplines for the study of logistics systems and enterprises. Its goal is to serve as an intellectual hub for research involving complex logistics systems and their potential to impact regional economies in a global network.

To achieve this goal, *JMI* seeks to advance our understanding of how business, government, technology, the environment and the human element interact within complex logistics systems to support sustainable and resilient economic growth. *JMI* fosters collaboration across UNT's strengths in emergency management, economics, geography, engineering, transportation and planning, digital commerce, and logistics. Through the synergy obtained through participating

faculty members and disciplines, the institute can produce new insights and means to create additional value through improved management of key processes associated with the movement of people, goods, and related information across the entire supply chain from point of origin to the source of supply. *JMI* will promote collaboration between government agencies, businesses, non-profits, service providers, and UNT researchers to examine how key logistical and related processes interact with geography, physical infrastructure, and socio-economic systems.

*JMI* will develop a research strategy around niche areas that are not already established research foci at other universities and institutes. Examples include advanced manufacturing, rapid prototyping and logistics, autonomy and logistics, disaster response and logistics, international aid and logistics, near shoring and re-shoring, and border crossing. *JMI* will seek to capture a sustainable revenue for its operation, administration, and investment, create innovative proposal submissions and focused, sustained research activity, and establish a reputation of innovation and intellectual advancement within the region.

### **Shared research facilities**

Large successful research programs most often require significant investment in instrumentation, equipment, and infrastructure. Complementing broad investment in these vital resources through faculty “start-up” funds, use of recovered Facilities and Administrative Costs from sponsored projects, and purchases using faculty member’s grant funds, a prudent and productive strategy is to invest institutional funds in shared research facilities.

To begin with, placing instruments, either newly purchased or “donated” by faculty members when underutilized and broadly applicable, within shared research facilities avoids duplication of potentially expensive equipment, freeing up funds for other acquisitions or uses. In addition, central administration of shared facilities provides a means to deliver ongoing technician support, payment of necessary service and maintenance contracts for instruments, and focus on upgrading and expanding available equipment.

Centrally administrated shared research facilities also create synergies among the faculty and student users, helping to cultivate and then enable larger sponsored projects that require multiple investigators and often multiple disciplines and institutions. Such shared facilities contribute directly to UNT’s national visibility directly and, more fundamentally, through their productive and impactful use, to the national visibility of the individuals and groups that use them.

UNT’s existing shared facilities include a high performance computing center, a vivarium for animal research, and a materials research center. Under development are shared facilities in bio-analytics, metabolomics, and genomics. Together, these existing and developing shared facilities support not only the broad range of research at UNT but support in particular research

within the *Institutes of Research Excellence*. For example, the shared facilities providing materials characterization and synthesis are directly associated with the *Advanced Materials and Manufacturing Institute*, as are the developing bio-analytic and -omics facilities with the *BioDiscovery Institute*.

## **Partnerships**

Building on existing and cultivating new opportunities for partnerships with other universities, industries, and national laboratories will be a key strategic thrust to build national visibility and expand sponsored projects success. Such partnerships intrinsically increase regional, national, and even international visibility. In addition, they help provide complementary expertise, facilities, and connections within sponsors and legislative authorities.

Some prototypes for such partnerships include the *Jim McNatt Institute for Logistics Research* connections with industries such as Toyota and Fort Worth's Alliance Airport, UNT's Sub-Antarctic Biocultural Conservation program that partners with the Chilean government, and NSF Industry-University Cooperative Research Centers for Net-Centric & Cloud Software & Systems and Center for Advanced Non-Ferrous Structural Alloys. In addition, UNT is pursuing closer collaborations with U.S. Department of Defense national laboratories through the establishment of Cooperative Research and Development Agreements and Educational Partnership Agreements highlighting activities and building new ones for the *Advanced Materials and Manufacturing Institute*.

Recognizing, and vigorously pursuing, the mutual advantage partnerships such as these examples represent, will contribute significantly to UNT reaching its goals for increased and more impactful research, student training and workforce development, faculty success, and national visibility.