Remarks by Brian Herman, Vice President for Research, University of Minnesota
Presentation to the University of Minnesota Board of Regents, December 9, 2016.

Welcome
I’m honored to present the annual “State of Research” report as Vice President for Research at the University of Minnesota.

Today, I will present our performance measures for FY 2016, including:
• The annual and ten year trends of sponsored research funding at the University;
• our progress in commercializing technology developed by our talented researchers;
• an analysis of our research enterprise compared to our regional, national and global peers; and
• The progress and promising directions of programs that I and a talented team of leaders in the Office of the Vice President of Research have stepped up to put into motion.

1. Slide: Research Priorities
Our work has been based on a set of overarching principles that should drive our research enterprise:
• Produce excellence
• Be transformative, lead not follow
• Advance transdisciplinary work
• Focus on critical, global challenges
• Present real, measurable results

Using those principles, we sought input from close to 4,000 individuals from within and outside of the University.

2. Slide: Five Years Forward: Areas
The result was a plan, our research strategic plan, Five Years Forward through Collective Inspiration and Discovery, that has allowed us to carefully structure ourselves and position ourselves in order to be competitive in a challenging period for research funding.

3. Slide: Five Years Forward: Successes
During my tenure, I have been proud of our many accomplishments of the Office of the Vice President for Research. Here are a few of them, and I will touch on some them later as well:
• The launching and administration of MnDRIVE, the partnership with the State of Minnesota in areas important to our economy and society. I think it’s a great model for how a research university can find mutual wins with public and private partners like
the state and industry. (I’m pleased that Regents Anderson, Devine and Lucas had a chance to hear about global food-related research by more than a dozen researchers under MnDRIVE on the St. Paul campus in October.)

- We launched the Office of University Economic Development, making connections for us across the state and raising our profile as a partner in economic development.
- We’ve pushed heavily on public-private partnerships, and our researchers have been very entrepreneurial, nearly doubling business & industry awards since 2013.
- Our Office of Technology Commercialization continues to grow and refine our connections to industry through innovative ways of licensing intellectual property created in our labs and facilities. In FY 2016 (which I will now just refer to as 2016), we passed our 100th startup company milestone since founding the Venture Center in 2006.
- Relatedly, we’ve created tools to help startups succeed and bring University ideas to the marketplace through our Discovery Capital program, which provides a 7:1 Return on Investment (ROI), and which is now part of our partnership with the Gener8tor startup accelerator.
- We’ve embraced serendipity through seven Convergence Colloquia and ongoing efforts to connect faculty and staff across the University in order to address large, complex problems and respond to multidisciplinary funding opportunities.
- Research Computing: We have consolidated the leadership of our informatics institute, our supercomputer institute and now our geo-spatial computing group, and are continuing to build research resources that are critical to—as well as tailored to—the success of scholars across the University and its many disciplines.
- Advancing Human Research Protections: a heavy but important lift for the U.
- We’ve overseen a doubling in size of the Hormel Institute in Austin.
- We’ve helped keep the University competitive by updating and sharing its infrastructure, including a very public new Driven to Discover research facility at the State Fair.

4. Slide: Maroon and Gold Measures
I know that you, as the Board of Regents, will be pleased to hear: we’ve achieved the research-related Maroon metrics in the University Progress Card well ahead of schedule:

- Our goal has been to be a top 10 public research university by expenditures, and we have been ranked number 8 in both 2014 and 2015, the latest data available.
- It was our goal to grow MN-IP agreements by 10% per year, which we have done, growing from 41 agreements in 2013 to 81 agreements in 2016. That’s a tribute in part to the creativity of our technology commercialization staff.
- We are on our way and ahead of schedule to meet the Gold research metric for R & D Expenditures, which is $900M in research expenditures by 2021 on the Twin Cities campus; we’re at $881 million now (and an all campuses expenditures of $910 million).
- We will share other successes in creating public partnerships and finding return on investment in our funding for projects and programs throughout this presentation.
5. **Transition Slide: Research Statistics**
   I will move now to talk about funding that was **awarded** in 2016.

6. **Chart Slide: Awards by Source**
   - University of Minnesota faculty, students and staff competed successfully for **$788 million in externally sponsored research awards** in 2016, **up 4.5% from 2015**.
   - This is a **record level** of externally sponsored research funding for the University when you remove one-time federal stimulus bill awards and continues our sustained growth trajectory since FY2012.
   - Our **federal awards remained relatively steady** and included some recovery from last year’s drop in National Institutes of Health funding.
   - **NIH was up 16.9%, while National Science Foundation (NSF) awards were down 8.8%**.
   - This week, Congress passed a bill to reauthorize NIH, the largest federal research funding agency. The bill is called the **21st Century Cures Act**, and it authorizes funding increases for certain areas of research and a general boost to the NIH budget. While there are promising directions in the bill, the proposed funding sources are not 100% solid and Congress will still need to appropriate funding increases annually.
   - Business & Industry awards were **up 3.6%** in 2016, and that’s on top of the 40% increase they saw in 2015.
   - The increases in business and industry funding can be attributed in part to **University strategies** focused on public-private partnerships.
   - I think the University needs to challenge itself to keep growing its business and industry portfolio. I **propose a goal of $100 million in additional B&I awards over the next five years**.
   - **State and local funding also grew by 15%** due to a small number of significant awards. (Recall that this amount doesn’t include MnDRIVE.)

7. **Chart Slide: Awards by College and Campus**
   - This next chart illustrates how the **$788 million** of externally sponsored research funding is distributed within the University by college and campus.
   - Those with **large annual increases** include the **College of Liberal Arts**, up more than 110%, due in part to a major award from NIH

8. **Story Slide: ABCD Youth Development Study, NIH**
   - That award was for $7.3 million from NIH’s National Institute on Drug Abuse to support research at the U’s Brain Cognitive Development study site.
   - The award will support research by William Iancu and Monica Luciano in the Department of Psychology on how substance abuse affects youth brain function, behavior and health.

9. **Chart Slide: Awards by Major Source Category**
   - This next chart summarizes a **10-year distribution trend** of externally sponsored research awards, **up 27.2% over ten years**.
• When adjusted for inflation, all annual award funding totals to the University over that period increased 9%.

10. Table Slide: Awards by Major Source Category
• And now let’s dive a little deeper into the sources of our awards, which we saw in a graph and now see in a table.
• B&I support has accounted for more than 10% of all externally funded research at the U of M over the past two years and is gaining in importance as federal funding continues to decline.
• Federal awards to the University of Minnesota rose by $43M over ten years. But its share has shrunk below 60% of total awards, and non-federal sources, including B&I, drove the increase in total awards between FY07 and FY16.
• You can see in this chart that B&I funding is up $33M over ten years and state funding up as well by $36M. [Docket slide had inflation adjusted #s]
• This trend aligns with three significant public-private partnership strategies launched since FY2011: MNDRIVE, MN-IP (Minnesota Innovation Partnerships) program and the Corporate Engagement Workgroup.
• Next up are projects that are good examples of diversified funding.

11. Story Slide: Spintronics Research
Semiconductor Research Corporation made another significant award, providing $5.6 million for Jian-Ping Wang and the Center for Spintronic Materials, Interfaces and Novel Architectures (C-SPIN) to help develop faster, smaller and more efficient computers based on the spin, rather than the charge, of an electron.

12. Story Slide: Center for Transportation Studies
• Five-year funding totaling $1.6 million from State of MN DOT and 11 other transportation agencies across the nation
• The observatory is a joint project of the Center for Transportation Studies and the Department of Civil, Environmental, and Geo-Engineering.
• Will provide information for planners in the 50 largest metro areas of the US about how easy it is for someone to get to a job, which can inform decisions for improving our transit and transportation infrastructure.

13. Chart Slide: Award Funding by Big Ten Institution
• This chart compares research award funding over ten years with the Big Ten Academic Alliance (BTAA, formerly the Committee on Institutional Cooperation). Within this elite group of universities, the U of M continued to rank third in new award funding (Minnesota is the thick gold line).
14. Transition Slide: National and Global Analysis
I am now going to switch from research awards to research expenditures, which are most often used for comparing and benchmarking universities but also typically lag a year behind in reporting.

15. Table Slide: Top 20 Public Institutions
• This slide shows the Top 20 Public Institutions.
• According to the National Science Foundation's Higher Education Research and Development (HERD) Survey data for 2015, the University maintained its rank of 8th among public research universities.
• That’s based on our research expenditures of $881M, which is composed of 68% extramural funding (as we talked about in the awards section), as well as 32% intramural (our own) funding.
• As we’ve heard in the news about our closest neighbor to the East, we saw some shuffling in the rankings above us, with Wisconsin dropping from 3rd to 5th.
• While we maintained our FY2015 ranking, I want to point out that number nine, Texas A&M, is only $14 million or 1.6% below our expenditure levels, and Pittsburgh, M.D. Anderson, and Ohio State are not far behind that.
• At the same time, for us to jump to number seven would require an $86 million or nearly 10% increases. Truly, it is easier for us to stumble than it is to leap upward in these rankings.
• The University also continues to hold steady on the Center for Managing University Performance and the Shanghai International rankings.

16. Transition Slide: Technology Commercialization and Economic Development
• Let’s move now to the Office for Technology Commercialization, which had continued strong growth in 2016.
• As we did last year, we’ve included an expanded annual report for technology commercialization as an insert to our printed annual report on research that you have today.

17. Table Slide: Technology Commercialization Data
Nearly all metrics show growth over the previous fiscal year:
• This chart indicates that the University has met the State’s biennial appropriations performance goal of a 3% increase on invention disclosures between 2015 and 2016.
• We actually went up nearly 14% to 402 disclosures
• We expanded our MN-IP Create program to create a third option, which helped us ink 81 MN-IP research agreements, with 62 companies, which resulted in over $12 million in related sponsored research.
• Additionally, a record 17 startups were launched in FY2016 in diverse sectors.

18. Story Slide: Startup Highlight Chart
• Since our Venture Center (part of our Office for Technology Commercialization) was
formed in 2006, more than 100 startups in a broad range of fields have been launched.

- UMN startups have raised in aggregate over $219 million in investment capital over that time period.
- Three out of four startups are based in Minnesota and 82 percent are still active today, well above the national average.


- Two University of Minnesota startups, Innotronics and Minnpura Technologies, were named among the 35 “Best University Startups 2016” by the National Council of Entrepreneurial Tech Transfer.
- Entrepreneurs from these companies presented to potential funders in Washington, DC, and visited members of Congress in order to highlight the important role of university startups in our broader economy.


- Another key public-private partnership strategy has been the establishment of the Office of University Economic Development (UED), in 2014, which now serves as the University’s “Front Door & More.”
- After spending significant time in 2015 meeting with individuals around the state and faculty and staff across the University system, UED approved a three-year plan. The plan has three themes: Expedite Access, Act Statewide, and Catalyze Economic Development.


UED works to improve access to the University’s resources for the drivers of statewide economic development—businesses, associations, governments and communities.

- They responded to 166 online “Front Door Requests,” a 70 percent increase over the previous year, including some from Fortune 500 companies.
- UED continued its partnership with the University of Minnesota Foundation called the Corporate Engagement Workgroup or CEW, which manages relations with companies that provided 16% of our overall B&I research awards.

22. Slide: Economic Development: Act Statewide

UED was active in both Greater Minnesota and the Minneapolis-St. Paul region:

- They hosted 63 business and community partner visits to the University and made 70 on-site visits to business and community partners.
- Over a quarter of these visits were to Greater Minnesota, so these efforts represented a key way that the U is connecting with these important Greater Minnesota communities, connections which may prove useful for my colleagues during the next legislative session.


- UED has had a major success in creating the Economic Development Fellows Consulting Program, a partnership with the Graduate School. The program oversaw nine projects
with Minnesota companies, involving 64 graduate students and providing roughly $60,000 in consulting value to the companies.

- They also helped us win a major national award from the Association of Public and Land-grant Universities (APLU) award for the most innovative public research university in the nation in its promotion of regional economic development.

24. Transition Slide: Capacity Building
Now I will talk about some of the programmatic directions that we believe are helping the U of M meet this changing funding environment by building our research capacity.

25. Slide: MnDRIVE
As I have noted, I have had the pleasure of overseeing the implementation of MnDRIVE, an innovative partnership between the University and the State of Minnesota.

- Since inception, more than $71 million in state resources have been authorized for MnDRIVE research across its four research areas: Robotics, Global Food, Environment, and Brain Conditions.
- MnDRIVE researchers have leveraged $167 million in additional state, federal and private funding from major companies and agencies such as Boston Scientific, NSF, the U.S. Department of Agriculture, and NIH.
- With these funds and others leveraged, the four MnDRIVE areas have hired 511 people, including 31 new faculty and hundreds of students and postdocs.
- MnDRIVE has involved more than 800 researchers in 116 departments, 29 colleges and three campuses (Twin Cities, Duluth and Morris).
- MnDRIVE supported researchers have also submitted 184 disclosures for inventions and helped launch 13 startup companies.
- They have conducted some substantial outreach at more than 900 meetings, symposia, workshops, and conferences with more than 77,000 attendees ranging from researchers to industry partners.
- MnDRIVE students have also been an area of success. Thus far, more than 30 MnDRIVE supported students have graduated, and 12 of those students have gone on to work in industry at places like Medtronic, Seagate and Toro.
- MnDRIVE has been a great success thus far, and I believe that the University and the state will do well to expand the program.

26. Story Slide: Natural Resource Research Institute
And we see a similar kind of success in a partnership with the Iron Range Resources and Rehabilitation Board (I-triple-R-B), which put up $300,000 for our Natural Resource Research Institute in Duluth to test a new technology for refining high-purity titanium dioxide from mineral deposits in northeastern Minnesota and to evaluate its potential for use in jet engines, mobile phones and more. The I-triple-R-B grant was matched by additional funds from OVPR and UMD.
27. Slide: Research Advancement
Over the past five years, the Office of the Vice President for Research has provided more than $36 million to researchers through several funding programs, and we have, I hope, added new emphasis on the return on investment these programs provide. The aims of these programs are to advance disciplinary and interdisciplinary initiatives and guide research infrastructure planning activities.

- Minnesota Futures program supports two significant interdisciplinary projects per year, and for every dollar invested, these projects have generated nearly $7 in external funding. [Detail: The 2016 Minnesota Futures grants went to two projects: one to develop new therapies to fight life-threatening fungal infections and one to explore genetic control of invasive fish species.]

- The Grant-in-Aid of Research, Artistry and Scholarship Program provides grants to support scholarly and artistic activities of faculty and their graduate students. Every dollar invested generated $4 in external funding. [Detail: $14.5 million over five years for projects in all disciplines and fields]

- Our Research Infrastructure Investment Program helps the University maintain robust, state-of-the-art equipment. Over five years it has helped seed and generate $37 million for 59 projects, which have been used by 2,000 researchers, generating more than 66 publications. [Detail: this year’s projects ranged from an asphalt performance tester at University of Minnesota Duluth to expanded 3D bio printing capacity to the Driven to Discover Research Facility (D2D) at the Minnesota State Fair.]

28. Slide: Advancing Human Research Protections
- As we continue to report to the Audit and Compliance Committee, this university is dedicated to meeting, upholding, and exceeding the highest ethical standards in research practices involving human participants.
- We are near the end of our implementation period for major changes to enhance our human research protection program.
- With the exception of our new electronic IRB system, nearly all of the 63 recommendations from our external review will be implemented by the end this month.
- Many faculty and staff have put in considerable time and effort into advancing human research protections and they have had significant accomplishments thus far.
- It will require continuous attention and focus from our research community.
- This is a challenging and vexing lift for the University. And, if I might speak candidly, it represents a broader issue for us: a disconnect between what our highly driven and competitive researchers believe their role to be on the one hand, and the public’s perception of what that role is.
- Just this past Tuesday at the University’s Deinard Memorial Lecture series, a highly esteemed panel of experts indicated “the experts we’ve been missing in medical science are the patients; and the future of biomedical science and the advance of biomedical science relies on better engaging them”.
• It is not enough that our research has the potential to save lives, or, outside the field of research involving human participants, that it has the potential to improve our lives, our society or even save our planet. The public also expects that our research processes are ethical; they expect to be shown how this work connects with their lives and to be actively included in the planning, execution, analysis and benefit of the research they participate in.

29. Slide: University Reputations: The Truths are not Self-Evident
• Universities are living in a new era of increased public skepticism about their mission, values and impact; there is a demand for increased scrutiny and accountability from the public and their elected representatives, who are asking about the return on societal investment in universities.
• A recent study by the firm Edelman confirms some of these ideas. It found among the public a “fraying belief in the state of higher education,” and echoing what I’ve alluded to, that “academic excellence is not enough.” Academics view success in terms of prestige among colleagues and institutions while the public expects us to demonstrate real-world impact.
• The study found a 20-percentage point gap between the public’s view on the role of the university and the view of academics in higher education. The public is expecting us to evolve, yet a majority of academicians see the traditional role of the university as critical to society.
• The study warns that universities are “at risk” for losing public support if they fail to demonstrate real-world impact and return on investment.1 In public higher education, we already see a trend toward decreasing support from state and federal government.
• To be successful, higher education, like many of our institutions and elements of our infrastructure, will need to take a hard look at its business models and the value proposition it provides to its communities. If we believe that our research enterprise remains vital to our success as a society and a nation, we need to continue to make the case for investment from diversified resources.

30. Slide: Conclusions
• To conclude, I would like to leave you with a few observations of my time here at the University of Minnesota.
• First, I want to thank you, the Regents and the President, for the opportunity to serve this institution and the state of Minnesota.
• Second, I hope the material we covered today has demonstrated the value that the current OVPR office, through its programs, people and strategic plan, provide to the University. With the right person at the helm of the OVPR and appropriate institutional vision, I am confident that the office can continue to be an equal partner with the

President, Provost and VP of Health Sciences in continuing to forge excellence in the research enterprise that I and the former occupants of this position, have achieved.

- Third, I personally am a strong believer in the need for this University and others to engage its public, legislative, non-profit and for-profit communities/partners in a much more robust and targeted way. Michael Porter of Harvard has suggested that using the approach of “shared value” means that we could create social and economic value at the same time.²
- And since business represents more than two-thirds of the total U.S. investment in research and development (R&D), and universities are focused on providing new innovative solutions to societal issues, a better alignment of these interests would incentivize more investment of business resources in higher education research.
- Of course, this will require serious rethinking of classical academic structures, organization, incentives and policies, and researchers’ roles, as well as careful avoidance of inappropriate conflicts of mission, but it could help universities continue to contribute to the public good in the face of declining public support.
- Most importantly, this can lead to success in the goal I outlined earlier- to generate an additional $100 million in Business and Industry awards over the next five years.
- I feel encouraged that the University can meet the challenges of this changing funding landscape.
- The University of Minnesota has many assets, in its people and in its infrastructure. If it can shift from “the way we’ve always done it” toward a more nimble and innovative culture, it can be a leader in adapting to the new research reality.
- I look forward to our discussion.

31. Slide: Data Sources

For more information visit: research.umn.edu/news/reports