Prepared remarks for presentation by
Christopher J. Cramer, Vice President for Research, Univ. of Minnesota
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2018 Annual Report on the Status of Research and Technology Commercialization
(not a transcript: see https://youtu.be/YtHUUNtaWxA?t=4894)

1. Annual report title slide
Pleased to be here to present this report

- Each year the Vice President for Research provides the Annual Report on the
  Status of University Research and Commercialization of Intellectual Property to
  the board.
- Purpose: documenting the trends in research productivity, scholarship, and
  commercialization of intellectual property as well as benchmarking the
  University’s performance and ranking among its peer group.
- State of our research enterprise is strong.
- Will share a combination of statistics and anecdotes.
- Will conclude with broad set of strategic priorities

2. Our OVPR Values: Partnership, Discovery, Integrity

Empowers partnership by providing resources, knowledge, and skill

- OVPR is a central resource for faculty, staff, students and external partners to
  conduct, manage, and sponsor research at the University of Minnesota, a top ten
  public research institution in the US. OVPR staff guide and support research
  efforts across the institutions.
- OVPR also serves as an active advocate for the importance of robust federal and
  state research funding, working closely with University partners and leadership
  to emphasize the value of research and the critical need for continued
  investment in basic research.

Fosters discovery that improves lives and addresses our society’s greatest challenges

- The conduct of research is fundamental to the University of Minnesota’s mission
  and is a key driver of innovation and economic growth in the state. Together, we
  pursue research to solve the world’s most vexing problems and advance the
  health and well-being of individuals and communities.
• Our programs encourage University research partnerships with industry and research projects that cross disciplinary boundaries, and we oversee technology commercialization at the University.

**Ensures integrity** through a commitment to research ethics and compliance in all we do

• UMN is dedicated to meeting, upholding and exceeding the highest ethical standards in research practices and aims to serve as a national model in the ethical conduct of research.

• OVPR oversees the University’s regulatory and compliance functions involving research with human participants and animals, biohazardous agents and research using stem cells and other human tissue.

3. **Research Statistics**

I will begin with awards information—the external sponsored grants our researchers competed for and brought home in FY2018. Awards data often includes multiyear grants that will be spent beyond the year they are awarded in.

Numbers are important.

4. **Awards by Source**

University of Minnesota faculty and staff competed successfully for $793 million in externally sponsored research awards in FY2018, up 6.5% from FY2017 (all federal R&D up 4.7%).

That’s a record amount, when funds from the one time American Recovery and Reinvestment Act of 2009 are taken out.

The $49 million increase follows a sustained pattern of average growth since FY2012.

You can see University has a diversified research funding base. Slices of the pie go from largest to smallest sources, from the top going clockwise, and you can see that the National Institutes of Health remains our largest single source of awards. The $265.5 million in awards is an increase of $22 million (8.8%) over the previous year.

In recent years, the timing and size of major NIH awards have been dramatically shifting, affecting the University’s federal research totals as much as $30 million in one year.

In FY2018, that timing resulted in an upward swing in award amounts and was punctuated by an $8.25 million award to the University’s Center for Clinical and Translational Science Institute (CTSI). (CTSI is approved to receive a total of $42.6 million over the next five years under its renewal by NIH.)
5. Awards by Source: federal broken out

As it is at all our peer institutions, federal awards, like those from NIH, mostly for basic research, are particularly important...

In this chart, federal agencies are grouped together and separated from all other sources: Federal sources constituted $494 million or 62.3% of sponsored research (up $56 million (12.7%) from last year)

6. Impact of Federal Shutdown

As you know, we recently experienced a 35-day partial federal shutdown. Although the shutdown did not affect FY2018, I have highlighted shutdown agencies in red (NSF and USDA) and funding slices where a subset of grants were affected are in orange (Universities and Colleges: these are our subawards, many from federal agencies, from researchers at other institutions. Other Federal: USGS, NEA, EPA).

Continuity and stability are important to us for many reasons, not the least of which is that the National Science Foundation (NSF) represents the second largest federal sponsor of University research. (University researchers competed successfully for $80.6 million, a $9 million (12.5%) increase over the previous year.)

7. Awards by Source: Department of Energy slice broken out

I want to give you some sense beyond the numbers by using some examples of research projects that underscore the depth of our research enterprise and its impact in communities.

My first story is about a grant from the Department of Energy, which regularly awards tens of millions in research resources to the U each year.

8. Ammonia Synthesis from Wind Energy

Question: Haber Bosch. World War I. Explosives. Fertilizer! Half the nitrogen in your body, 1/3 of the planet’s population. What percentage of the world’s energy usage goes to producing ammonia? (Regent Sviggum knows: key to ag) Answer: Ammonia production is estimated to require 1-2% of the world’s entire energy budget because most current production requires high heat and high pressure (carbon footprint).

- So here we have a $2.6 million grant from the US Department of Energy’s (DOE) ARPA-E agency—the department’s “wild idea” division.
- U of M is leading a project to develop a small-scale ammonia synthesis system using water and air, powered by wind energy. (Stranded power)
• Stored ammonia can be used for fertilizer, fuel, and as energy for an electrical grid, creating a renewable and local source of energy for farms and other businesses.

• The U of M’s West Central Research and Outreach Center (WCROC) in Morris, MN serves as a demonstration site, and the research (CEMS) builds on earlier work funded by the University and by the state’s Environment and Natural Resources Trust Fund, administered through the Legislative-Citizen Commission on Minnesota Resources (LCCMR).

• Great demonstration of U’s impact outside the Twin Cities, of cooperation across campuses and disciplines (CSE, CFANS and the Department of Energy’s National Renewable Energy Lab), and sustainability.

• Great example: strategic funding from the state and other sources can be leveraged for larger scale federal investments.


Here you see a ten-year distribution trend of externally sponsored research awards (not adjusted for inflation) for FY2009 to FY2018.

You can see that FY2018 was a continuation of a sustained growth curve/positive trendline, with federal awards and state and local awards up this year. (Our MnDRIVE partnership with the state of Minnesota is accounted for elsewhere.)

10. 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. (It’s good to compare ourselves to ourselves, but also to others.)

11. National Rankings

As you’ll see, the number here is 921M, which is larger than the $793M I just spoke of. Expenditures also include an institution’s own funds dedicated to research, often times these are strategically made seed grants, matching funds, startup packages for new faculty, and paying students (including undergraduates).

• Our office awards a significant number of merit based awards to researchers and creative scholars across the disciplines each year. We also oversee the MnDRIVE program, which has chalked up considerable return on investment and research successes.

• National Science Foundation Higher Education Research and Development (NSF HERD) Survey is the most trusted comparative source for information about research universities. It lags a year behind, so these expenditure numbers are from FY2017.
• The University of Minnesota is among the top 2% of colleges and universities reporting in the HERD survey.
• The University maintained its top 10 status among public research universities, posting $922 million in research expenditures.
• This is a chart of the top Big Ten schools in the rankings.
• HERD Survey requirements mean that only UMTC stats are represented in this list. When all U of M campuses are reported together, total R&D expenditures systemwide were $948 million.
• The University of Minnesota is among the top 2% of colleges and universities reporting in the HERD survey.
• By two other widely cited ranking systems: the Center for Measuring University Performance (CMUP; only 8 are 9 of 9!) and the Academic Ranking of World Universities (ARWU), the University remains highly competitive compared with its peers.

12. Awards by source: Department of Education slice broken out

Another story about research impact now—this one in the area of education. Our UMTC College of Education and Human Development is world renowned, ranked #3 behind Harvard and Stanford in the Shanghai/ARWU rankings.

13. Supporting Teachers with Research Based Interventions

We have two grants led by CEHD’s Clayton Cook from the federal Institute of Education Sciences (IES) to develop and evaluate teacher intervention methods.

• First is a $1.4 million three-year project to help elementary educators to adopt and deliver evidence-based classroom practices (EBPs) to better meet the social, emotional, and behavioral needs of students;
  o This project is partnered with St Paul Public Schools, Lakeville Area Public Schools, and the Princeton School District, looking at urban, suburban and semi-rural schools.
• Second is a four-year, $1.4 million project to pilot test a dropout prevention strategy for 9th grade students as they transition into high school, and is aimed in particular at historically underserved student populations. (Partnered with Seattle and surrounding schools.)
  o The primary aim of the grant is to iteratively develop and pilot test a developmentally appropriate and culturally responsive student-teacher relationship intervention for entering 9th graders. (The student-teacher relationship is a critical protective factor in the transition to high school.)
• So, here you have a great example of the kind of research that can help schools here in Minnesota and all across the country to help students succeed and address the achievement gap.

14. Technology Commercialization and Business Partnership

15. University of Minnesota Startup Activity

Here’s a slide indicating the diversity of our startups, and an indication that 102 out of 132 were founded in Minnesota.

Our startups also have a high rate of viability, with more than 75% still active since 2006.

16. Awards by Source: State and NIH broken out

My next story involves researchers who were supported by NIH as well as the state (via the Translational Product Development Fund (TPDF), which is supported by the Minnesota Partnership for Biotechnology and Medical Genomics).

Put another way, sponsored research funding very often lays the groundwork for our startups and for licenses we sell to existing companies.

17. U Startup Corebiome acquired by Orasure

CoreBiome Inc. was founded by UMN scientists (Knights, Beckman and Gohl) two years ago.

• Kenny Beckman is the head of our Genomics Center, and the center’s knowledge of genomics and informatics was key to beginning this company.

• And the company had support from our Technology Commercialization staff, including our Venture Center.

• The startup uses University-developed technology to analyze communities of microbes (flora and fauna) for human health, agricultural, and environmental applications.

• I know it makes some uncomfortable, but there are more microbes in your gut than cells in your body. Each of those microbes has its own genetic information, so you can imagine that the analysis/number crunching around even just one person’s microbiome involves very large sets of data.

• CoreBiome was purchased last month by Pennsylvania-based OraSure Technologies Inc., a developer, manufacturer, and distributor of devices that detect or diagnose critical medical conditions.
• It’s the fourth University startup to be acquired or go public in the last 18 months, which is an indication that the market has real demand for innovations being commercialized by the U.

• It was also another success for our Discovery Capital Program, which has invested $2.7 million to date in select UMN startups, attracting total matches of $20 million for these startups. (Yielded positive returns on two companies thus far.)

18. Technology Commercialization

And we are committed to that process—to facilitating and accelerating the transfer of knowledge into the world where it can have the most impact and do the most good.

• Our Technology Commercialization office is a key part of that process at the University, working from the inside out and the outside in to match research with the needs of industry.

• Their staff guide those interested in launching new companies, licensing new ideas and innovations, sponsoring research, and accessing University expertise.

• UMN ranked as the sixth best public university technology transfer office in the country, and fourth among all US universities in terms of license deals completed, according to a study by the Milken Institute two years ago, and they’ve only signed more licensing agreements since then.

• In May 2018, UMN’s Technology Commercialization office was named one of five finalists nominated worldwide for the 2018 "Tech Transfer Unit of the Year" award from London-based Global University Venturing.

Some highlights from this past year:

• The number of new licenses for University technologies was up 17 (8.0%).

• Revenue generating agreements were up as well.

• The number of patents granted to UMN inventors increased FY2017 to FY2018, from 147 to 186, an increase of 26.5% (Indicative of good work done ~5-10 years ago).

• With regard to our innovative and much imitated MN-IP program, we had an increase in new sponsored research commitments.

• We had a record number of number of business engagements through our MN-IP agreements (86) and an increase from last year in the number of companies who have signed agreements (58).

• The amount of sponsored research brought in under our MN-IP program also increased (slightly)
• And the Venture Center launched 13 new startup companies and ended FY2018 with 27 companies in the startup pipeline. (at least partly “lumpy data”-a lot before and a lot since)

In FY2018, Technology Commercialization staff played a lead role in securing two major sponsored research contracts (Mitsubishi Tanabe Pharma and Toray). I want to talk about one of those projects now.

19. Awards by source: B&I broken out

In FY2018, Technology Commercialization staff played a lead role in securing two major sponsored research contracts from industry (Mitsubishi Tanabe Pharma and Toray). I want to talk about one of those projects now.

20. Finding New Therapies for Alcohol Use Disorder

U of M researchers (Mark Thomas, Neuroscience, lead researcher) are working with Mitsubishi Tanabe Pharma to better understand the changes in neural circuits that underlie persistent alcohol-induced changes in behavior.

- The project combines an animal model with sophisticated whole-brain fMRI imaging to create a baseline of knowledge of how brain cell dynamics change during specific phases of addiction.
- The project leverages our Center for Magnetic Resonance Research, a key intersection of University disciplines for the health sciences and the College of Science and Engineering.
- Understanding these brain cell dynamic changes will provide new targets for therapeutic intervention and a means to evaluate whether these targets are engaged by new pharmacotherapies.

21. Capacity Building Programs

As I alluded to previously, we at OVPR oversee a number of programs and initiatives designed to support and nurture a diverse research portfolio with investments aimed at growth and innovation. Those include MnDRIVE, Research Computing (including Informatics Institute), and Research Advancement (seed grants I referred to earlier).

Here’s one example of how we’re trying to meet the needs of our research community...to nimbly address the growing need for data storage in many curring edge disciplines.

22. A New Design for Managing the Deluge of Data

A universitywide team of data experts is tackling the challenges of mounting data storage needs across the U.

Data-intensive research practices, such as DNA sequencing, high-resolution imaging, and the bioinformatics work at Rochester that you heard Chancellor Carrell talk about
yesterday, while critical for advancing cutting-edge research, roughly doubled the U’s data storage needs from 2016 to 2019.

The University Storage Council, including experts across the system campuses, the Office of Information Technology, OVPR, and the University Libraries, aims to better coordinate and allocate data to improve the experience for researchers seeking reliable storage and make data storage more efficient and cost effective.

23. **Research is Teaching**

Sometimes feel like it’s lost in the abstract idea of research—in the numbers, discussions, and definitions. The research mission very much distinguishes us as the state’s only R1 university and addresses the needs of our state and our nation.

- Too often the inseparability of our research and teaching missions is lost on even our strongest advocates
- But our teaching mission is not something that’s simply bolted onto research.
- Research adds to our students’ education, and students are a fundamental component of our research work (in fact, most researchers are students).
- These students learn and develop skills they can’t get elsewhere. They are trained in a unique environment.
- We also had 5,500 undergraduate students across the University system enrolled in coursework in directed research experiences. Another 700+ were paid through undergrad research opportunities programs (which payed over $1M directly to those students).
- Many of our students—even undergraduates--are paid for their research, offsetting their tuition or housing.
- Did you know that out of $750M in research awards, $61.2 M went to direct support of students, both grad and undergrad?

Critically, for the state’s only research university, research is teaching—we embed discovery in our curriculum!

24. **Research Strategic Priorities**

25. **Research Strategic Priorities**

Want to give you a brief overview of our strategic priorities, which align well with the strategic priorities the board adopted last year.

**Enhance Research Excellence**

- Make strategic investments in our research infrastructure, including support for informatics and for answering large and complex interdisciplinary grant solicitations.
• Invest in researcher-driven projects

• Leverage the breadth of the University of Minnesota to help researchers across the University system to connect and to bolster work on such critical topics as opioids and addictions, aging, and sustainability in the face of climate change.

• The renewal of the University’s clinical and translational research center by NIH and our new agreement with Fairview bode well for future research success. (New strengths to leverage.)

• Plan to engage with our federal relations staff to ensure that we are well positioned for new sources of research funding.

**Promote and Sustain Research Integrity**

We continue to build a culture of ethics, best practices for compliance processes, and robust oversight.

**Accelerate the Transfer of Knowledge for the Public Good**

I highlighted several examples of our successes moving ideas to the marketplace; need to continue to deepen and broaden that work and, in the minds of our public and their representatives, connect the work of research with how we teach our students

26. **End slide**

We are a service organization – let the thoroughbreds run!!! Thank you for your attention. Glad to take you questions.

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