

Research & Interdisciplinarity

Academic and Student Affairs Committee,
Board of Regents

February 13, 2014

Karen Hanson, Senior Vice President for Academic Affairs and Provost

Brian Herman, Vice President for Research

Trevor Ames, Professor and Dean, College of Veterinary Medicine

Timothy J. Ebner, Professor and Head, Department of Neuroscience

Carissa Schively Slotterback, Associate Professor and Director, Urban
and Regional Planning Program, Humphrey School of Public Affairs



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Minnesota Global Food Venture

Trevor Ames

Professor and Dean, College of Veterinary Medicine



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Minnesota Global Food Venture (GFV)

The MN Global Food Venture is a public-private partnership committed to answering the global imperative of safe, nutritious and affordable food, through the application of innovative discovery in agricultural, food, nutrition and health technologies, and next generation workforce development.

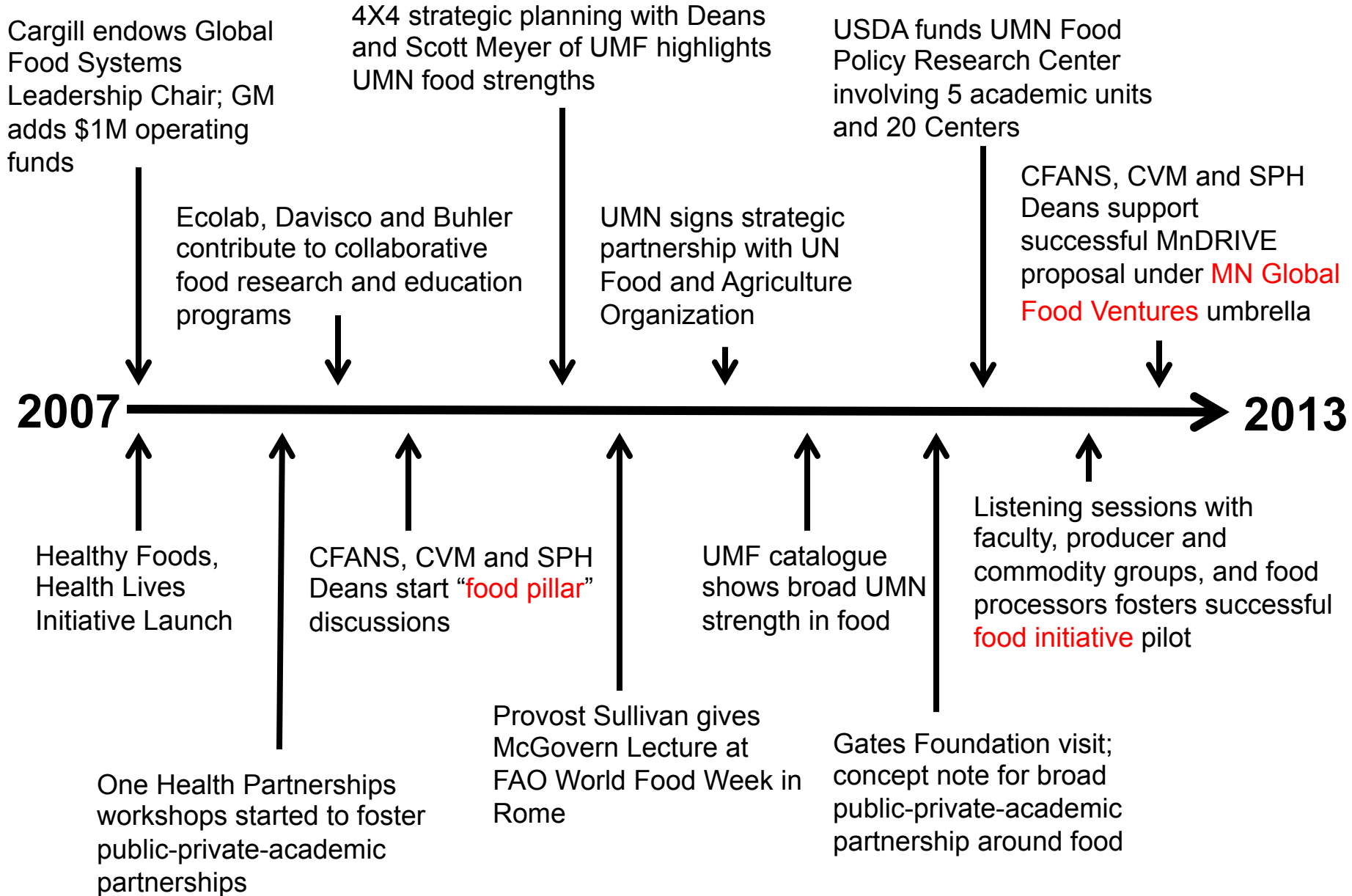
“Leadership. Legacy. Impact”



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

UMN Food Initiative Time Line



Food Industry and Commodity Group Roundtables Recap

What did we discuss?

What ideas emerged?

What suggestions were
made?



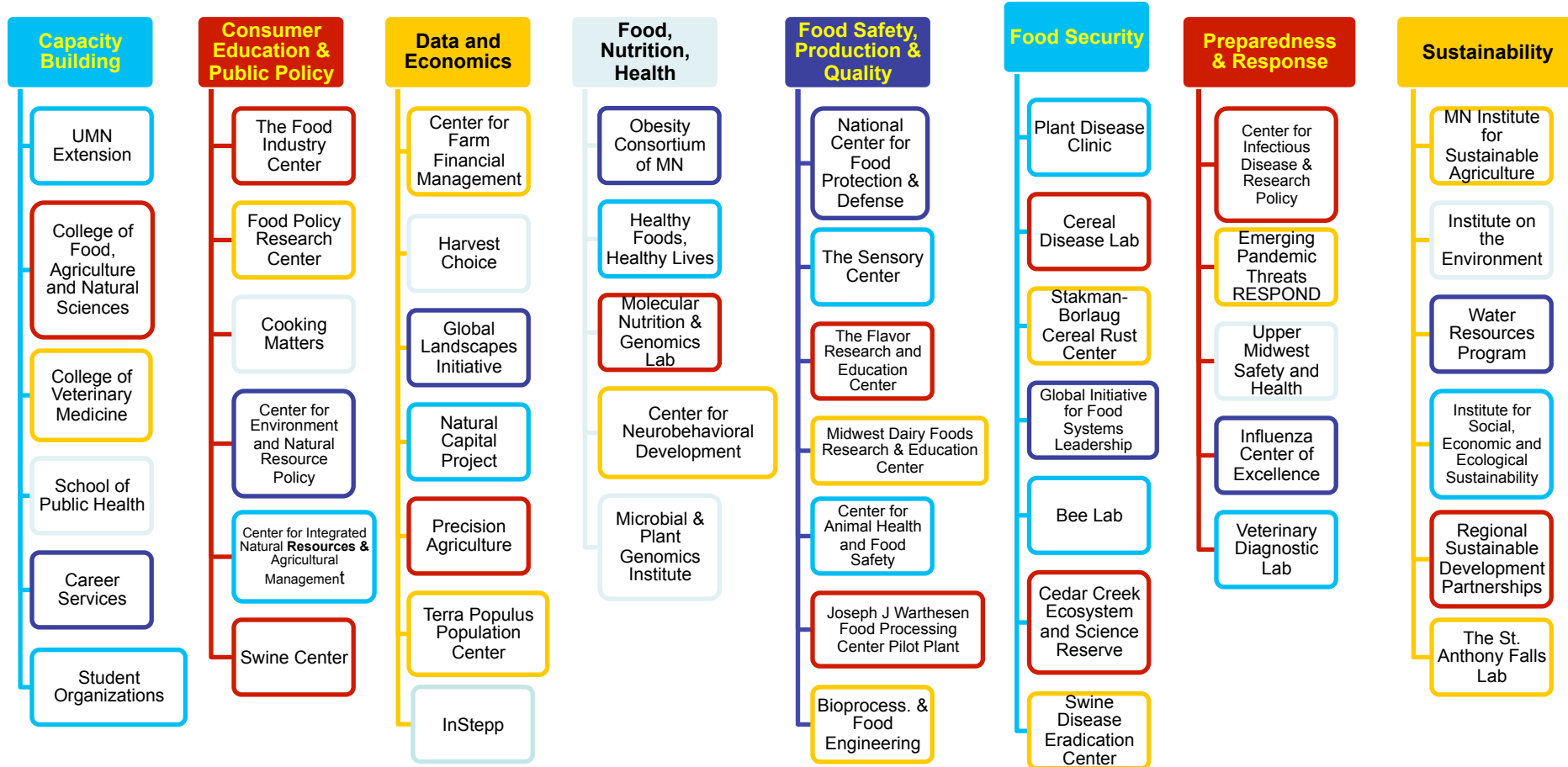
WHAT WE HEARD!



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

UMN Food Capabilities



1. Interaction & Partnering with UMN

- Overall, positive feedback about relations with UMN faculty, particularly in R&D
- Currently forming interdisciplinary university groups
- Departments seem to be disconnected – they need help to collaborate internally
- Researcher: “just ask us for \$\$”
- Issues with agreeing IP – we’re not the same as the pharmaceutical sector
- The relationship depends heavily on the personalities of both sides of the partnership
- UMN resources would benefit from having more relationship management expertise
- ‘It would be shameful not to take advantage of this unique concentration of (food) expertise.’
- Being local does not automatically mean UMN is a preferred partner
- Other universities have improved their partnering models – replicate?



2. UMN Education Role

- Producing excellent grads is the #1 priority – research programs are a means to this end
- If asked • **Producing excellent (food) grads is #1 priority** for grads; for example add cross-functional teamwork, management, and communications
- • **Food Industry wants to engage in education**
- • **Need continuing education for food industry employees**
- • **Need continuing education for food industry employees**
- As boomers retire, need more grads with experience in sophisticated science systems
- Enable and encourage more interactions (formal and informal) between PSPs and UMN students – perhaps without faculty
- Invite PSP staff to be guest faculty members, particularly in final year – and not just the occasional 60 minute presentation
- UMN is significant supplier of talented food scientists and engineers



3. Research Priorities

- Perhaps the UMN's food capabilities matrix is too broad (spread too thin?)
 - Capability 'breadth' is important
- or can/should focus on being world-class in a few selected areas?
 - **AND**
- University should focus on basic research – don't compete with PSPs
- Environmental sustainability is most important water & soil sciences (multiple)
 - Be world-class in selected areas
- Food safety and quality (multiple)
 - Partner with Private-Sector
- Food security (multiple)
 - Partners, don't compete
- Food & health
- Plant breeding technologies



4. Cross-Disciplinary Collaboration

- Silos are very present and are risking the future of partnering with PSPs
- Need less focus on bricks and mortar 'centers' more on virtual teams that can form easily, collaborate productively, and disperse quickly
- Why not create a 'smart entry portal' where a PSP can enter (search) a topic or issue and be automatically connected with all relevant UMN research groups?
- Increased collaboration within the university must not complicate the relationships with PSPs – the Private-Sector Partners
- UMN needs to be the aggregator of food expertise in public and private sectors
- PSPs have also been successful in sharing their experiences
- Collaboration must be supported (driven) by leadership, to remove barriers; 'Think big. Start small. Scale fast.'
- UMN should create a new 21st Century 'brand' about how it operates – necessarily (very) different from the 1960s and 1860s
- Rising to the challenge of 'feeding 9B in 2050' should excite and motivate faculty & students





UNIVERSITY OF MINNESOTA
Driven to Discover™

University of Minnesota Food Portal Prototype

ENTER



HERE

MINNESOTA GLOBAL FOOD VENTURE
UNIVERSITY OF MINNESOTA



Food Related Interdisciplinary Centers



UNIVERSITY OF MINNESOTA

FOOD POLICY RESEARCH CENTER



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Leveraging UMN's Global Food Venture



to Maximize Success of MnDRIVE



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

If you had \$2-4M per year to invest in scientific research and commercialization, and workforce development to grow Minnesota's agriculture and food industry, and improve the health of Minnesota's citizens, how would you invest it?



Advancing Discoveries and Treatments for Brain Conditions: Neuromodulation

Timothy J. Ebner, M.D./Ph.D.

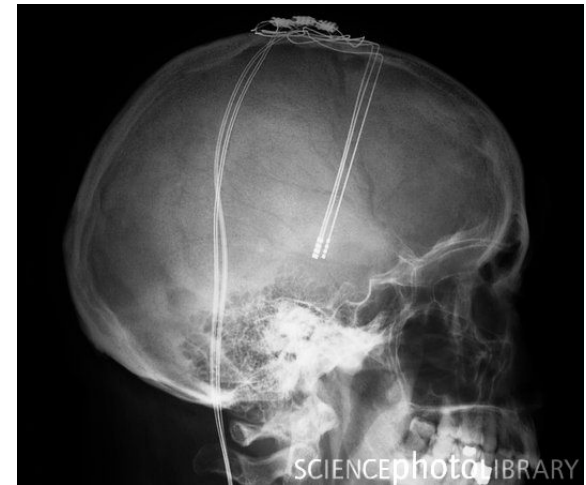
Professor and Head, Department of Neuroscience



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

What is neuromodulation?

- Therapeutic intervention that changes (modulates) the activity of brain circuits to decrease symptoms and restore normal functions
- Deep brain stimulation (DBS) for Parkinson's disease as a successful example
- Transcranial magnetic or direct current stimulation are newer, non-invasive approaches



The Grand Challenge

- Nervous system disorders affect 1 in 5 Americans at an annual cost of ~\$500 billion
- Understanding the fundamental causes of most neurological and psychiatric diseases remains at a roadblock and most new drugs have failed
- Need new therapeutic interventions to improve quality of life and lessen economic impact
- Neuromodulation DBS is one of the premier examples of combining basic knowledge of brain function with new technology and translating those advances into successful therapy



Real World Problems with the Potential for Enormous Impact

Parkinson's disease

- Since 1980, 100,000 patients treated with DBS
- Only 10% of the Parkinson's patients in need of DBS

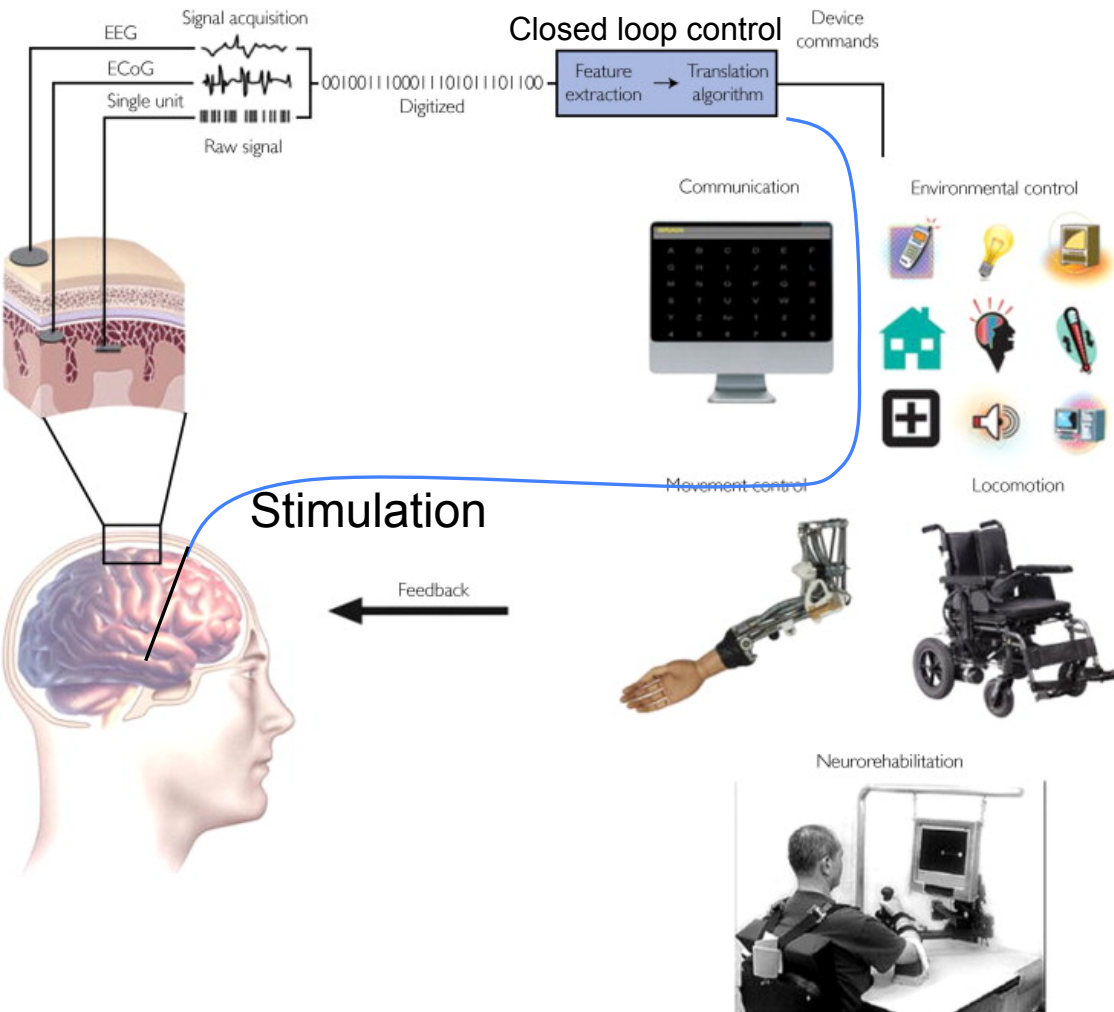
Major Depressive Disorder

- 350 million cases world-wide
- Only 50% adequately treated in the U.S. alone



Goals of MnDrive Neuromodulation

Closed-loop Control

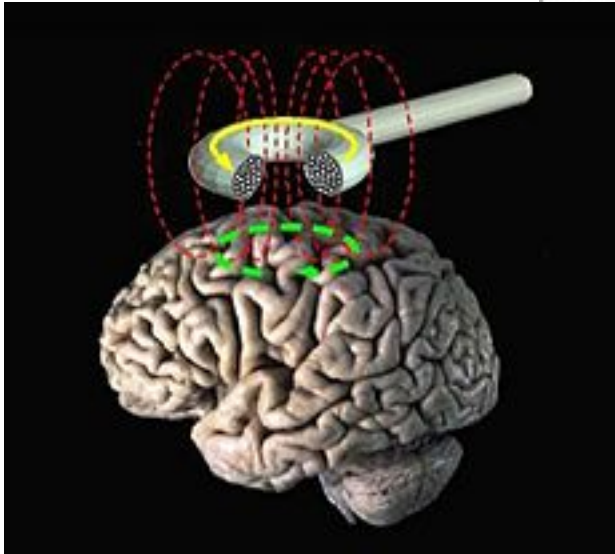


- Extract signals from the brain to control stimulators
- Novel systems to couple brain to implanted systems



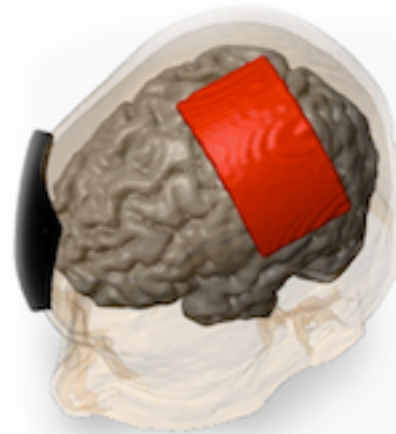
Goals of MnDrive Neuromodulation

Minimally Invasive Stimulation



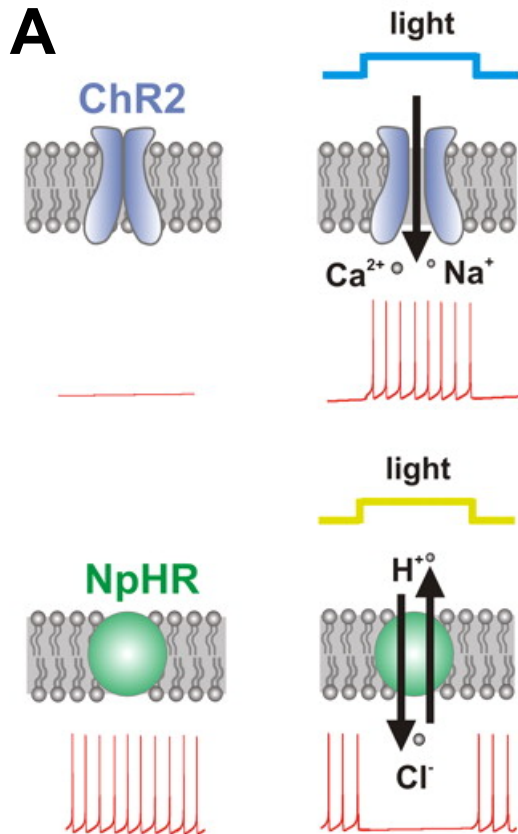
Transcranial Magnetic Stimulation (TMS)

Transcranial Direct Current Stimulation (tDCS)

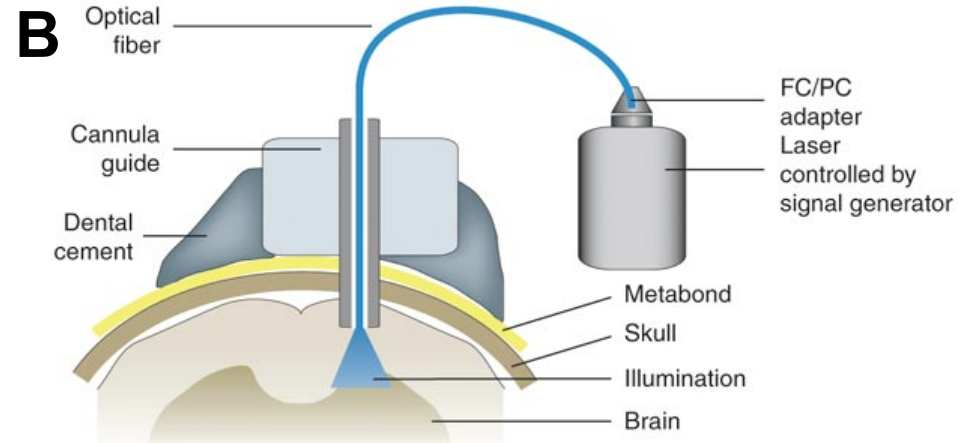


Goals of MnDrive Neuromodulation?

Develop New Tools: Optogenetics



From: Knöpfel T et al., 2010
J. Neurosci. 30:14998-15004



From: Zhang F et al., 2010 Nature Protocols 5: 439 - 456

- Use genetically engineered proteins that can be controlled by light
- Allows for precise control of the cells of interest
- Allows for excitation or inhibition of brain cells
- Allows for precise temporal and spatial control over brain cells



President Obama's BRAIN Initiative (Brain Research through Advancing Innovative Neurotechnologies)

- DARPA announces Systems-based Neurotechnology for Emerging Therapies (SUBNETS) on Oct 24, 2013
- SUBNETS is focused on neuromodulation
- Neuromodulation also central to other NIH BRAIN initiatives recently announced
- Seven weeks to propose to develop mechanistic models of 7 neuropsychiatric/neurological disorders and develop new precise, effective neuromodulation strategies to restore function



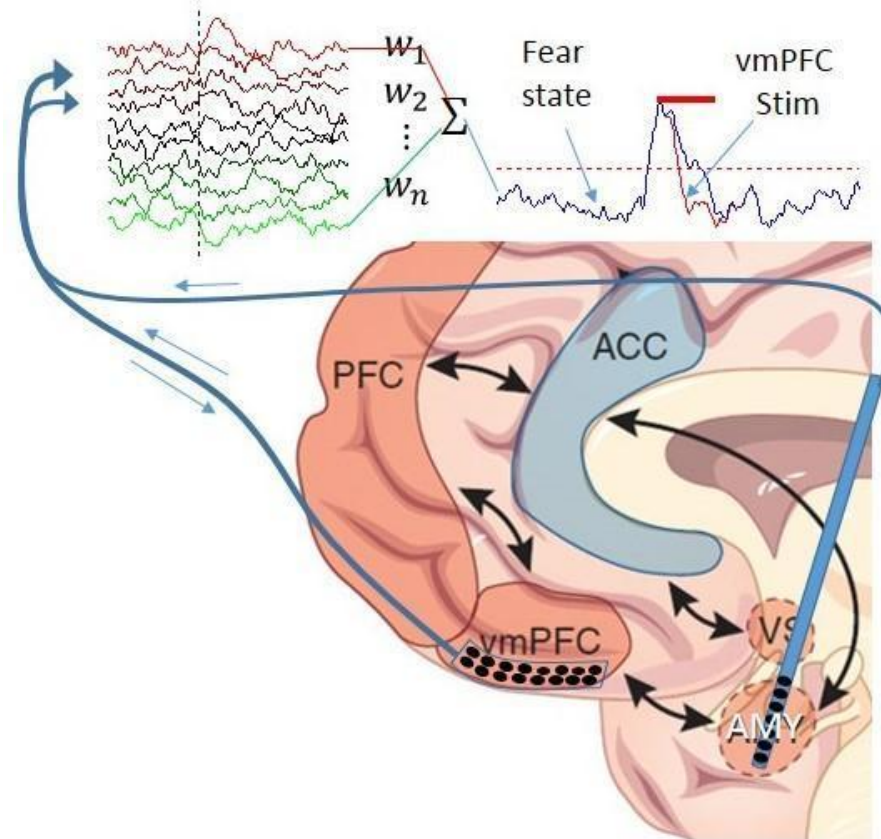
Highly Interdisciplinary

NEUROMODULATION DARPA GRANT APPLICATION

- 27 faculty members from 7 departments at the University joined to write the application
 - Co-Principal Investigators:
 - Tim Ebner, Neuroscience
 - Bin He, Biomedical Engineering
 - Kelvin Lim, Psychiatry
 - Jerry Vitek, Neurology
- Requested \$33M
- Partnering with three companies: Medtronic, Inc., Cochlear Limited, NeuroNexus
- Collaborating with the University of Wisconsin-Madison



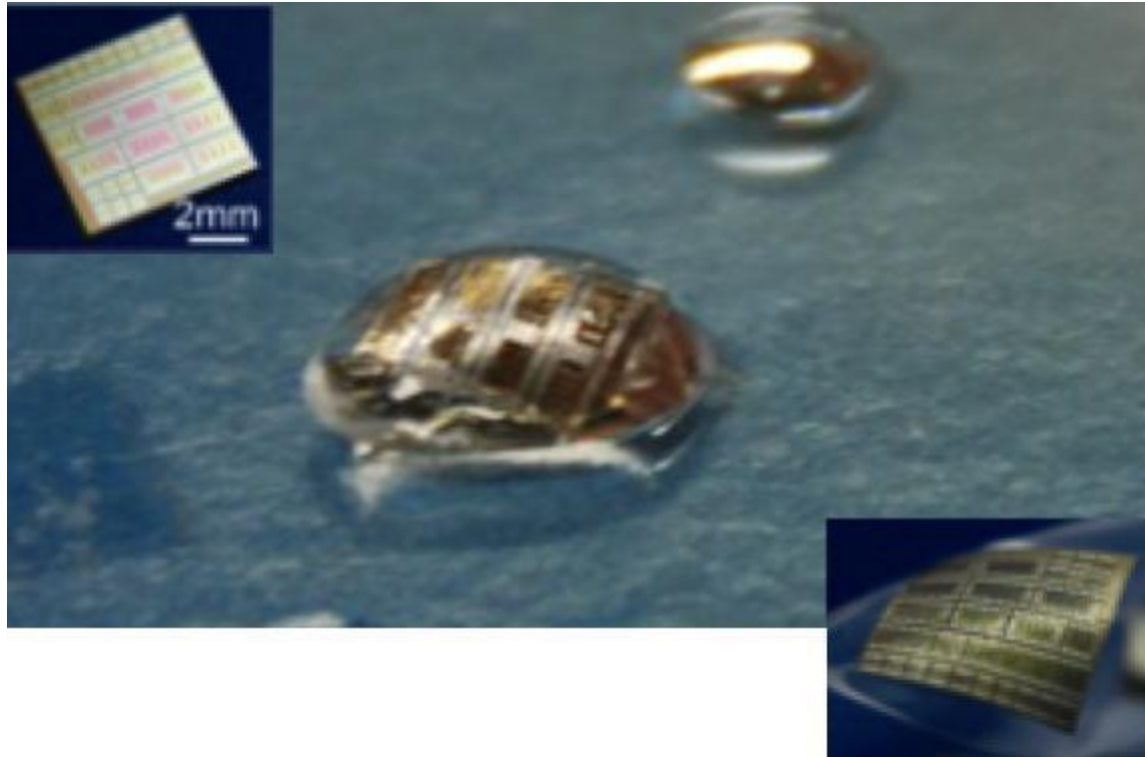
Novel Closed Loop Stimulation for Neuropsychiatric Disease



- Decoding fear response in PTSD to close the loop
- Drive stimulation in ventral medial prefrontal cortex



Developing New Sensors and Electrodes



A soft silicon (S3)-like device as fabricated (upper left), laid on a drop of water after liftoff (center), and bonded to polydimethylsiloxane elastomer (lower right).



What is the impact?

Make Minnesota the world leader in neuromodulation

- Improve health and reduce suffering of Minnesotans
- Strengthen the medical device industry
- Increase federal funding for research
- Attract the very best trainees and faculty
- Drive interdisciplinary research



Resilient Communities Project

Carissa Schively Slotterback

Associate Professor and Director, Urban and Regional
Planning Program, Humphrey School of Public Affairs

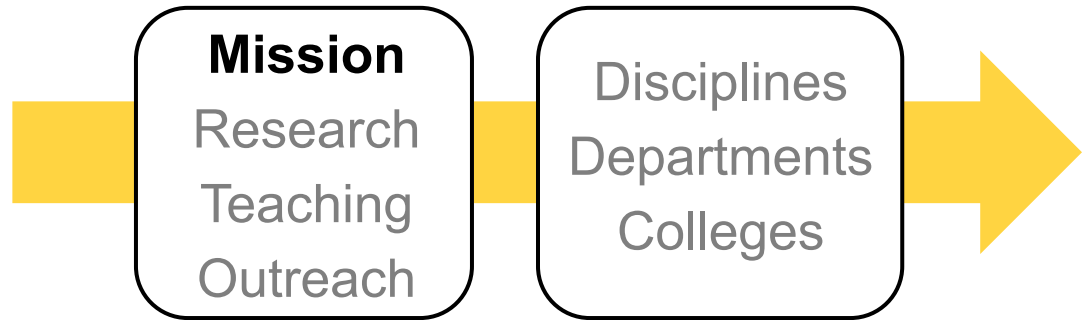


UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Resilient Communities Project

University – Community
engagement program
advances **applied**
interdisciplinary
research



rcp.umn.edu



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

Resilient Communities Project

How?

1 year UMN + community **partnership** to advance sustainability and resilience

1

Partner community identifies 15-25 projects

2

RCP matches with UMN courses

3

Students complete projects in courses



Resilient Communities Project

What?

2 communities

Minnetonka
North St. Paul

30+ projects

Travel demand management policy
Housing program evaluation
Conservation development standards
Green energy initiative
Emerald Ash Borer management plan
Downtown revitalization
Public art planning

45+ course matches

Environmental Communication
Ecology of Agricultural Systems
Urban Hydrology & Land Development
Design Thinking for Action
Multidisciplinary Perspectives on Aging
Identity & Symbols
Designing Adult Education
Energy Policy

Dozens of departments

10 colleges

400+ students



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Resilient Communities Project

Why?

Communities + students + faculty

Address **critical community priorities** that require multi-disciplinary expertise

Create applied research opportunities for students on **emerging issues** in the **real world**

Build **long-term networks** for faculty + practitioners to foster ongoing engagement



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Resilient Communities Project

The bigger picture...



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

Resilient Communities Project

The bigger picture...

Building the practice of sustainability

Expanding **sustainability education** at the UMN – training the next generation of practitioners

Integrating the **multi-disciplinary** knowledge essential to sustainable outcomes

Supporting community + university **innovation**

Advancing a **model of engagement** that is more collaborative + fully integrated across our mission



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM

Research & Interdisciplinarity

Academic and Student Affairs Committee,
Board of Regents

February 13, 2014

Karen Hanson, Senior Vice President for Academic Affairs and Provost

Brian Herman, Vice President for Research

Trevor Ames, Professor and Dean, College of Veterinary Medicine

Timothy J. Ebner, Professor and Head, Department of Neuroscience

Carissa Schively Slotterback, Associate Professor and Director, Urban
and Regional Planning Program, Humphrey School of Public Affairs



UNIVERSITY OF MINNESOTA
Driven to DiscoverSM