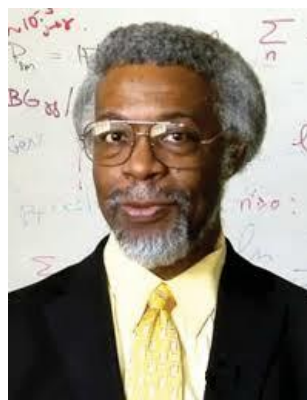


# TPSE MATH

## The first steps

Mark Green, UCLA

# TPSE Group



Phillip  
Griffiths,  
IAS

Eric  
Friedlander,  
USC

Jim Gates,  
U. Maryland

Mark Green,  
UCLA

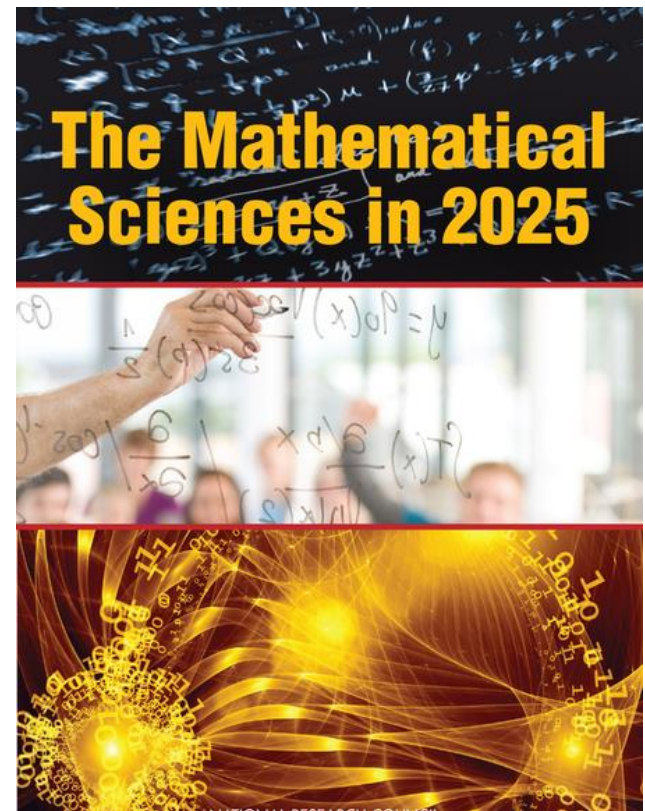
Tara Holm,  
Cornell

Uri  
Treisman,  
UT Austin

TPSE gratefully acknowledges funding from Carnegie Corp of NY and the Sloan foundation

# Why Now?

## REPORT TO THE PRESIDENT ENGAGE TO EXCEL: PRODUCING ONE MILLION ADDITIONAL COLLEGE GRADUATES WITH DEGREES IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS



# Our First Communication

“We seek your help in encouraging constructive change in postsecondary mathematics education. We are all aware of the forces at work: the expanding set of careers using mathematics and the changing types of mathematics that they use, the rise of online education, declines in state funding, and the tsunami of student debt. These issues have been the focus recently of two very different, significant reports: PCAST’s Engage to Excel and the National Academies’ The Mathematical Sciences in 2025.”

# Panel at the JMM, Jan 2014

## **Panelists:**

- \* Michele Cahill, VP National Programs, Carnegie Corporation of New York
- \* Jo Handelsman, Yale University
- \* Brit Kirwan, Chancellor, University of Maryland
- \* Joan Leitzel, former President, University of New Hampshire
- \* Phillip Griffiths, moderator
- \* Guest commentator: Congressman Jerry McNerny

## **Topics:**

- \* A more useful undergraduate experience: the evolving needs and expectations of undergraduates who take mathematics
- \* The implications for mathematics departments of the economic and productivity issues facing higher education
- \* Lowering barriers to STEM success

# Meeting at UT Austin, June 2014

## **Five Topics**

1. Curriculum Reform
2. Removing Barriers and Opening Pathways
3. Teaching and the Economic Model of Math Depts
4. Enriching the Undergraduate Experience
5. Enhancing the Graduate Training Experience

# Diversify Teaching Methods

- \* Aim for a position of leadership in the use of technology and online education
- \* Widen the use of teaching methods that promote student engagement
- \* Make use of research on teaching in designing programs and courses
- \* Collect data and rigorously evaluate innovations

# Broaden the Curriculum

- \* Offer students experiences in multiple modes of mathematical thinking, including modeling, algorithms and computation, probability and statistical thinking
- \* Incorporate real-world applications of mathematics as motivation where possible
- \* Align the curriculum with 21<sup>st</sup> century careers
- \* Work in partnership with client disciplines
- \* Changes should grow out of the strength and inner coherence of the mathematical sciences



# Toward a Teaching Community

- \* Integrate teaching faculty as valued members into the life of the department
- \* Reach out to form regional collaborative networks across types of institution
- \* Reward collective as well as individual efforts to improve undergraduate education
- \* Enhanced professional development to forward implementation of innovations
- \* Disseminate and scale up successful innovations

# More Pathways, Fewer Barriers

- \* Create multiple pathways into the postsecondary curriculum
- \* Align gateway courses with the majors they lead into, with high school exit courses and with community college courses
- \* More intensive counseling and career services for students in gateway courses

# Balance Costs and Programs

- \* Universities and students are under intense financial pressures
- \* Presently, Math departments tend to have lower costs/student than most departments
- \* Actively pursue teaching and learning strategies that deliver improved outcome at lower cost
- \* Work with administrations to use cost savings to increase departmental capacity

# Listen and Communicate

- \* Listen to the various publics we serve
- \* Better communicate the importance of the mathematical sciences
- \* Have a communication strategy as innovations are rolled out
- \* Improve recruiting of students to Math and STEM, make them more aware of the careers that depend on Math

# Serve All Our Potential Students

- \* Design courses to meet the needs of students from other disciplines at all levels
- \* Intensify diversity efforts, with deeper involvement of the professional societies
- \* Be mindful of the needs of transfer students, align with the courses they take at local community colleges

# Broaden Training of Graduate Students

- \* Broaden the curriculum to provide appropriate training for the 60% of grad students who will not go into academic jobs
- \* Introduce skills such as computation, statistics, modeling
- \* Increase access to internships
- \* Design and implement more Mathematics Masters programs
- \* Implement more Masters programs as a bridge to PhD programs for weaker students
- \* Allow all grad students to teach their own class
- \* Promote communication skills of grad students
- \* Encourage networking at the graduate level

# Open Problem: Fostering Community-wide Change

- \* A strategy is needed for systemic change
- \* Resources and funding are needed, at first from funding agencies, but eventually from university administrations
- \* Great things are happening, but need to be scaled up
- \* Materials will need to be created and faculty taught how to use them
- \* Conversations will need to take place at individual institutions about how to adapt national ideas to their students and available resources
- \* The landscape of students and institutions is complex—  
**One size does not fit all**

# Convenings of Stakeholders

## **Stakeholders:**

- \* Mathematical Sciences departments
- \* User departments
- \* University administrations
- \* Graduate and undergraduate students



# Convenings of Stakeholders

## Goals of Convenings:

- \* Update the curriculum to match expanded uses of Math and the 21<sup>st</sup> century jobs that rely on them.
- \* Partner with user departments.
- \* Diversify methods of teaching, build a teaching community.
- \* Provide multiple pathways into Mathematical Sciences.
- \* Expand the varieties of mathematical thinking and experiences in Math courses.
- \* Align resources with needs.

**Overarching goal: From Barrier to Gateway.**

# Whither TPSE Math?

## **TPSE Math hopes to enable:**

- A combination of outreach, networking, information-gathering, publicity, and support for mathematicians already developing and evaluating new models and techniques of education.
- Partnerships across our community.
- Scaling of innovative ideas already being implemented at local and national levels.
- Positive culture change by cross-fertilizing “around the edges” and promoting a collective sense of where things need to move.



**THANK YOU!**