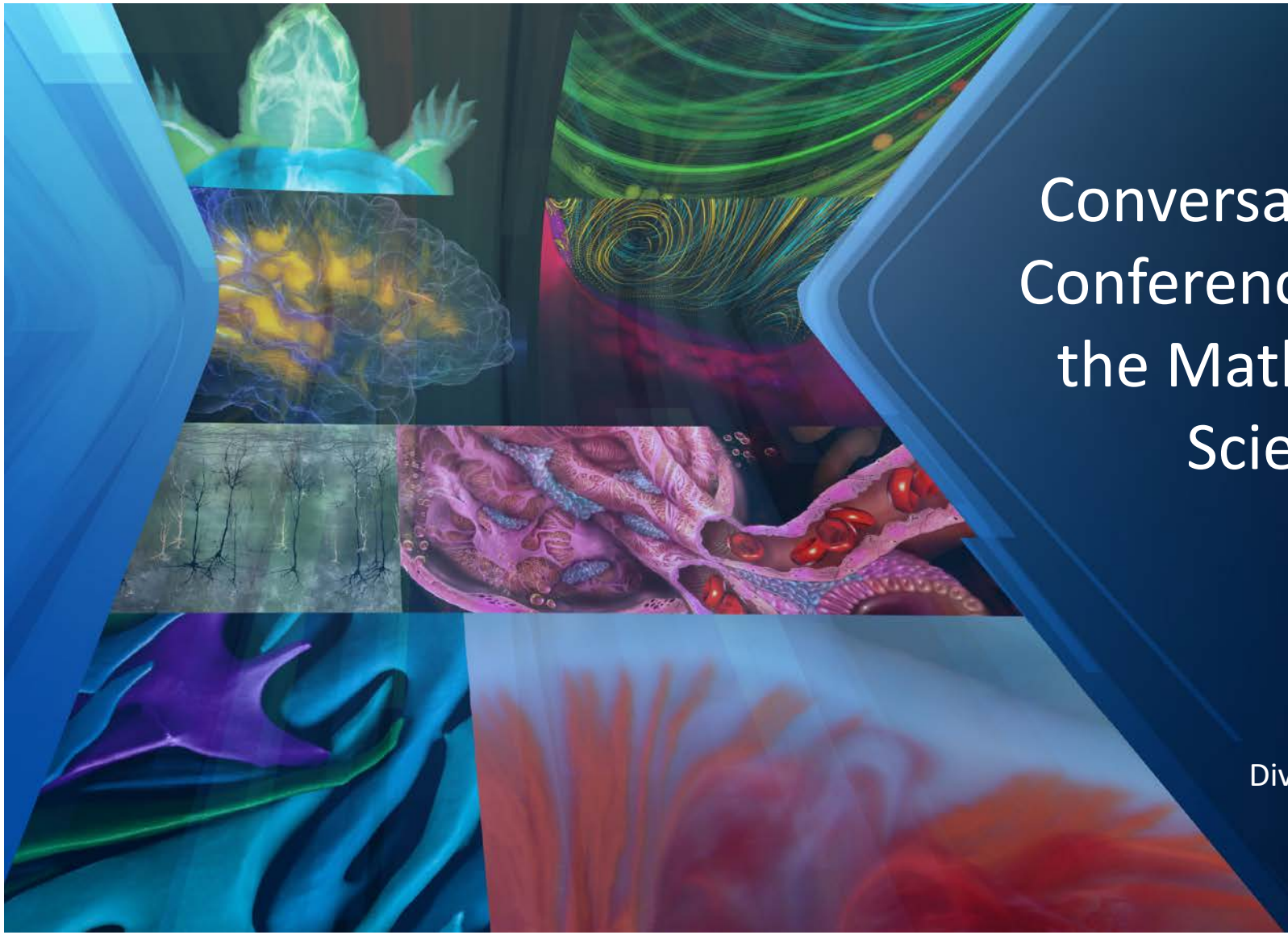


Conversations with Conference Board of the Mathematical Sciences

Juan C. Meza
Division of Mathematical Sciences
May 4, 2018

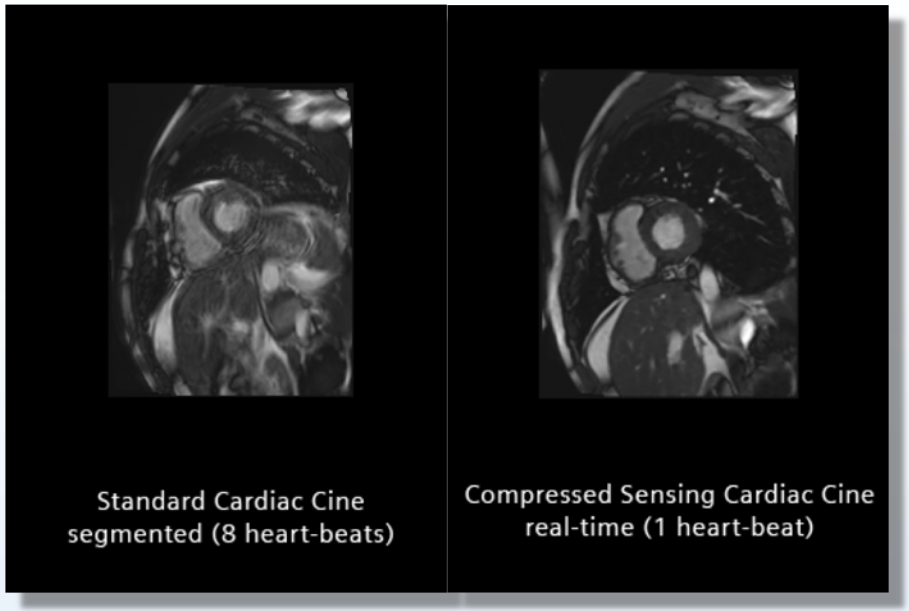
DMS Highlights
and
Sample Activities

DMS Quick Facts

$233M	FY17 Budget
64%	Support of US Basic Math Research
~3000	Proposals reviewed each year
24%	Average Funding Rate
28	Program Directors

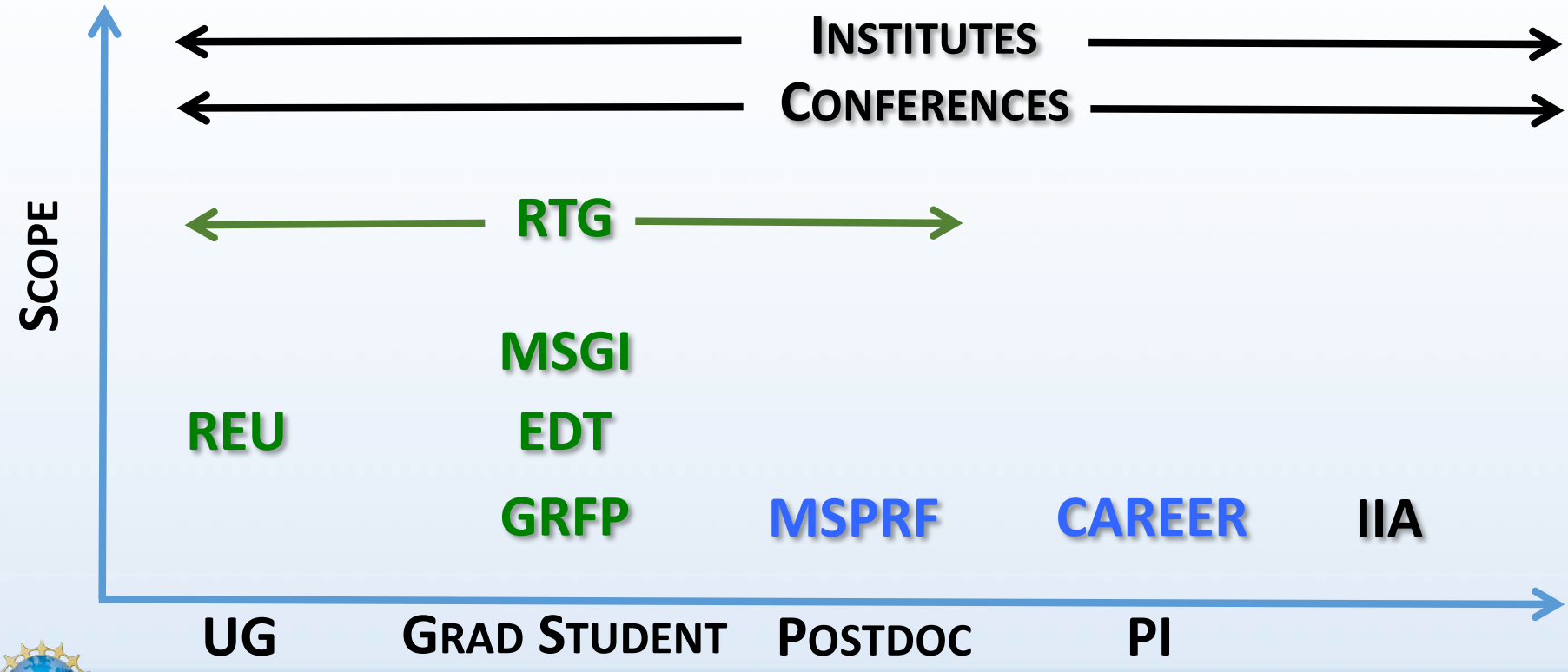
DMS Funded Research Has a BIG Impact

- FDA approved 2 new MRI devices that dramatically speed up scanning, **between 8 and 16 times faster** than conventional methods.
- Both products use **compressed sensing,** a breakthrough technique developed over **10 years ago** by NSF/DMS-supported mathematicians.
- The speedup will **allow more patients to be served at a lower cost per patient**, giving US taxpayers a better return on the tens of billions of dollars in annual MRI charges.



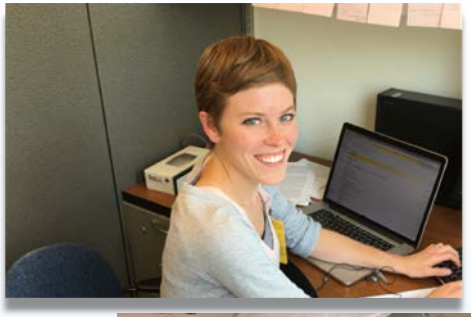
A Focused Research Group on Multiscale Geometric Analysis – Theory, Tools, Applications. DMS – 0140698/Donoho (Lead), DMS – 0140540/Candes, DMS – 0140587/Huo, DMS – 0140623/Jones

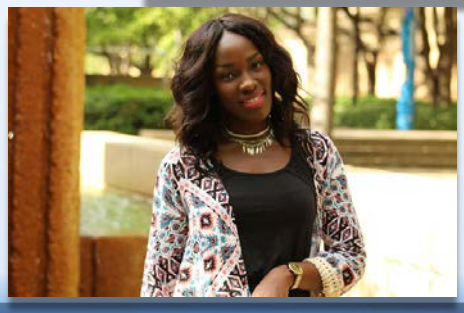
DMS Programs Address a Wide Range of Stages in the Pipeline



Mathematical Sciences Graduate Internship

- Provide an opportunity for mathematical sciences doctoral students to participate in internships at national laboratories, industry and other approved facilities
- Aimed at students who are interested in understanding the application of advanced mathematical and statistical techniques to "real world" problems, regardless of whether the student plans to pursue an academic or nonacademic career
- 40 graduate students from 38 universities worked in 10 National Labs in the Summer of 2017





SIAM News Article (12/01/2017)

Managed by Oak Ridge Institute for Science and Education

Math Institutes Diversity Initiative

- NSF Mathematical Science Research Institutes work together to raise funds and sponsor conferences and workshops.
- Institutes partner with the Association for Women in Mathematics (AWM), the National Association of Mathematicians (NAM) and the National Alliance for Doctoral Studies in the Mathematical Sciences.
- The Committee awards prizes to winners of the AWM poster sessions and NAM new PhDs sessions. Research presentations from member institutes at the Field of Dreams Conference.

https://mathinstitutes.org/diversity/

Infinite Possibilities Conference
Howard University, April 14-15, 2018

Spring Opportunities Workshop for Women in the Mathematical Sciences

Blackwell Tapia Conference 2016

Support for Conferences

- Support for a broad range of conferences, especially those with a focus on broadening participation
- Involvement of students and junior investigators a DMS priority
- Support for professional societies, CBMS, National Academies (BMSA and CATS), and international conferences (ICIAM, ICM)

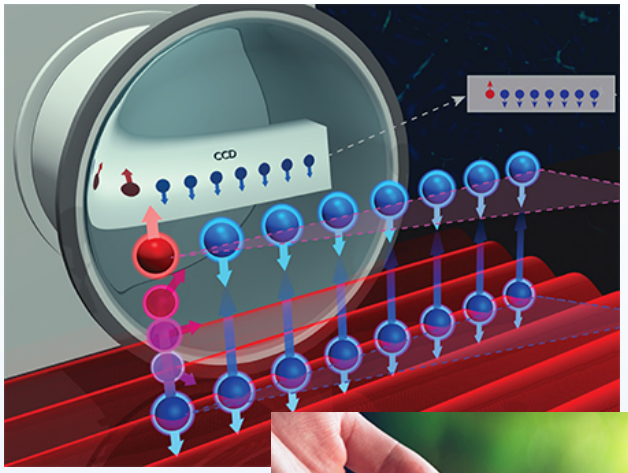
Opportunities Looking Forward

Ten Big Ideas for Future NSF Investment Research

- Harnessing Data for 21st Century Science and Engineering
- Understanding the Rules of Life: Predicting Phenotype
- The Quantum Leap: Leading the Next Quantum Revolution
- Windows on the Universe: The Era of Multi-messenger Astrophysics
- Navigating the New Arctic
- The Future of Work at the Human-Technology Frontier

Connections to Big Ideas

- Mathematical aspects of advancing fundamental understanding of quantum phenomena, materials, systems, and information processing methods (DCL NSF 18-035)
- Define the key challenges and research imperatives to understand the organizational principles and rules of living systems. Seeking Conference, EAGER, and RAISE proposals (DCL NSF 18-031)

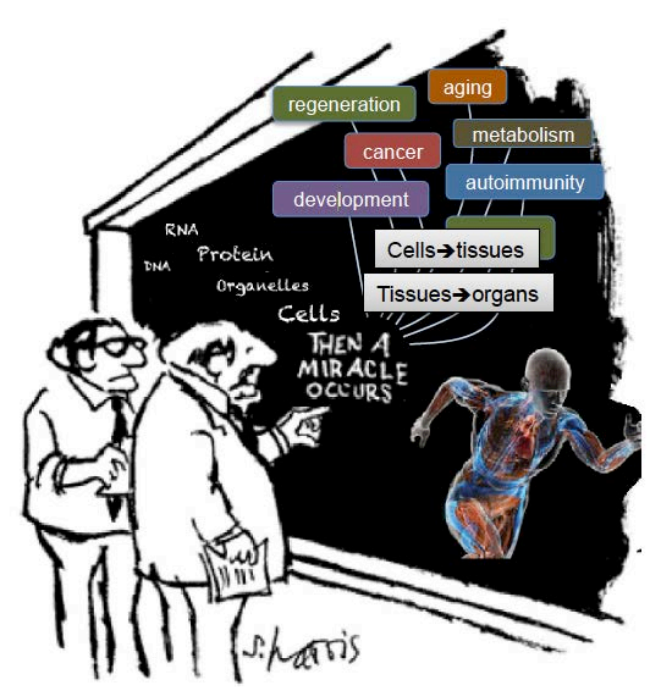


Quantum Leap

Rules of Life

NSF-Simons Research Centers for Mathematics of Complex Biological Systems

- Funded equally by NSF and Simons Foundation
- 3 NSF Divisions: Mathematical Sciences, Integrative Organismal Systems, Molecular and Cellular Biosciences
- Support mathematical approaches aimed at understanding:
  - the complex causal relationships leading to emergent properties of molecular, cellular and organismal systems, or
  - to the emergent properties resulting from the complex integration across these levels of organization at different time scales
- Close, sustained collaborations between biologists and mathematical scientists that leverage their complementary expertise



"I think you should be more explicit here in step two."

TRIPODS - Transdisciplinary Research in Principles of Data Science

- Joint DMS & Division of Computing and Communications Foundations
- Bring together the statistics, mathematics, and theoretical computer science communities to develop the theoretical foundations of data science through integrated research and training activities
- 12 phase I awards. Each $500K per year for three years
- First PI Meeting held in Oct. 2017

SUMMARY

- DMS funded mathematical sciences research is having a big impact in society, science, engineering
- We have many programs aimed at increasing numbers of American students and broadening participation
- 10 Big Ideas important to future of DMS

THANK YOU!