

MPS Division of Mathematical Sciences

Briefing for MPS Advisory Committee

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Division Director
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COMMUNITY INPUT IS A CORNERSTONE OF DMS STRATEGY

- **DMS STRONGLY BELIEVES IN A GROUND-UP APPROACH IN DESIGNING PROGRAMS USING COMMUNITY INPUT**
 - MPS AC, COV
 - NAS REPORTS/STUDIES
 - PROFESSIONAL SOCIETIES
- **EMERGING RESEARCH TOPICS**
 - QUANTUM COMPUTING MATERIALS CHALLENGES WORKSHOP, AUGUST 2018
 - INNOVATION LAB: LEARNING THE POWER OF DATA IN CHEMISTRY



TRIPODS PROGRAM

- WORKSHOP ON THEORETICAL FOUNDATIONS OF DATA SCIENCE: ALGORITHMIC, MATHEMATICAL, AND STATISTICAL, APRIL 2016
- JOINT WORKING GROUP OF DMS AND CCF PROGRAM DIRECTORS RECOMMENDED CREATION OF TRIPODS PROGRAM
- SOLICITATION RELEASED IN SEPTEMBER 2016
- 12 PROJECTS AWARDED IN AUGUST 2017



BROWN



Stony Brook University

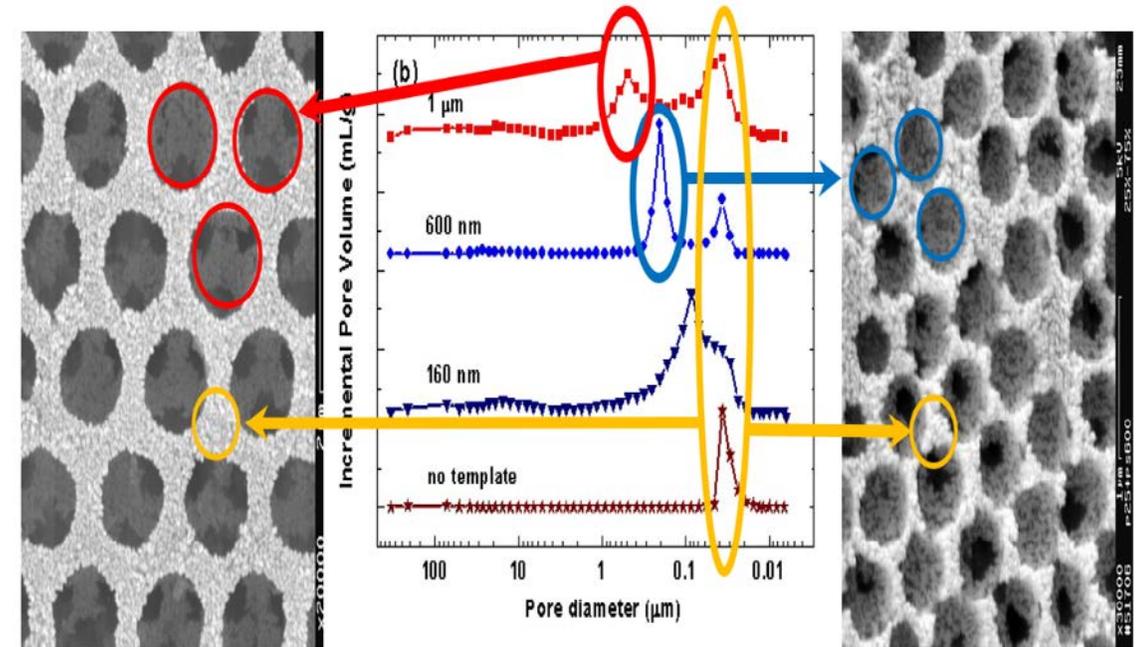


WISCONSIN UNIVERSITY OF WISCONSIN-MADISON



TRIPODS HIGHLIGHT

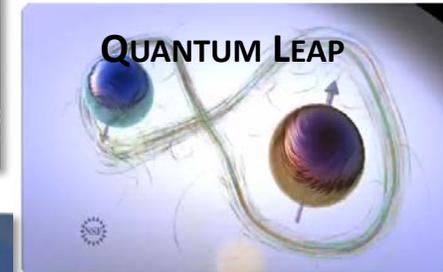
- TEMPLATING IS A METHOD FOR MAKING MICROSTRUCTURES WITH USEFUL INTERNAL POROSITY
- GOAL IS TO EXTRACT QUANTITATIVE AND DESCRIPTIVE TOPOLOGICAL AND STATISTICAL INFORMATION ABOUT 3D MICROSTRUCTURES.
- NEW AREA OF TOPOLOGICAL DATA ANALYSIS ADVANCES THE DESIGN OF TEMPLATED MICROSTRUCTURE DESIGNS



QUANTIFICATION OF PORE STRUCTURES CREATED BY REMOVING NETWORKS OF SPHERICAL POLYSTYRENE TEMPLATES, LEAVING BEHIND A STRUCTURAL SCAFFOLDING OF FUSED NANOPARTICLES OF TiO_2 .

DMS UPCOMING ACTIVITIES IN FY 2019

- MATHEMATICAL SCIENCES RESEARCH INSTITUTE COMPETITION
- ENGAGEMENT IN BIG IDEAS (QL, HDR, URoL, ETC.)
- JOINT DMS-NATIONAL LIBRARY OF MEDICINE (NIH) INITIATIVE ON GENERALIZABLE DATA SCIENCE METHODS IN BIOMEDICAL RESEARCH
- WORKSHOPS IN STATISTICS AND MATH BIOLOGY ON EMERGING RESEARCH FRONTIERS
- PREPARATION FOR COMMITTEE OF VISITORS IN FY 2020



Backup Slides



TRIPODS -HIGHLIGHT

- PHILIPPE RIGOLLET (MIT MATH) WORKING WITH BIOLOGISTS MOR NITZAN AND GEOFF SCHIEBINGER APPLIED CONCEPTS OF OPTIMAL TRANSPORT TO SINGLE-CELL DATA ANALYSIS
- DOMAIN ADAPTATION IS USED TO RECONCILE DATA COLLECTED FROM THE SAME TISSUE BUT ANALYZED UNDER DIFFERENT EXPERIMENTAL SETUP
- NEW TECHNIQUE TO REGULARIZE HIGH-DIMENSIONAL TECHNIQUES LEADS TO NEW METHODS FOR DOMAIN ADAPTATION THAT OUTPERFORM CURRENT METHODS.

DOMAIN ADAPTATION FOR SCRNA-SEQ
Projection to first two principal components

