Association Presentations

- **AMS**: Douglas Mupasiri, Chair, Committee on Education, AMS; University of Northern Iowa
- **ASA**: Donna LaLonde, Director, Strategic Initiatives and Outreach, ASA
- **MAA**: Michael Boardman, Chair, Committee for the Undergraduate Program in Mathematics, MAA; Pacific University
- **SIAM**: Peter Turner, Fellow & former VP for Education, SIAM; Director, Institute for STEM Education Clarkson University
TPSE Math Meeting
Doug Mupasiri
(with help from Helen Grundman)
AMS
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Focus on Upper-Division Pathways,
Baltimore, Maryland
June 14, 2017
AMS Activities that are relevant to upper-division pathways

AMS Books: These and many of the graduate level textbooks are resources faculty can use to offer a wide range of upper-division regular as well as independent study courses.

- AMS Pure and Applied Texts  
  http://bookstore.ams.org/AMSTEXT
- Student Mathematical Library  
  http://bookstore.ams.org/STML
- Mathematical World  
  http://bookstore.ams.org/MAWRLD
AMS Activities

MathSciNet Database: Makes it easy for students to search and access new and older mathematics research related to their interests. This is a particularly useful resource for students involved in research. [http://www.ams.org/mr-database](http://www.ams.org/mr-database)

- AMS Open Math Notes: Though still in its infancy, this is a very useful repository of mathematics lecture notes, which is available to students free-of-charge. [http://www.ams.org/publications/open-math-notes/omns-about](http://www.ams.org/publications/open-math-notes/omns-about)

- Notices of the AMS has a section “Doceamus” on teaching – not in most recent issues
AMS Activities

AMS blogs that often include relevant topics:

• On Teaching and Learning Mathematics - http://blogs.ams.org/matheducation/


• Inclusion/Exclusion - http://blogs.ams.org/inclusionexclusion/
AMS Activities

• AMS Mathematical Moments: These are examples of how math is used in the real world, available as posters and podcasts. A packet of the small posters is sent to each math department each year along with ideas on how to use them informally or more formally in the classroom.

http://www.ams.org/samplings/mathmoments/mathmoments
AMS Activities

Committee on Education Annual Meeting – held in October.

Department Chairs Workshop – held the day before the JMM meetings in January each year.
Guidelines

- **GAISE: Guidelines for Assessment and Instruction in Statistics Education**
  - Provides direction for initial course and helps remove barriers for entrance into upper division pathways by ensuring integrity of the prerequisite and supporting an active learning thus engaging course design.

- **Curriculum Guidelines for Undergraduate Programs in Statistical Science**
  - Provides guidelines for developing statistical science program curricula, both for statistical science majors and for students in other majors seeking a minor or concentration in statistical science.

- **Curriculum Guidelines for Undergraduate Programs in Data Science**
  - Endorsement of these guidelines supports curricular initiatives in this emerging area.
Co-Curricular Initiatives
Experiences to Engage and Encourage

- **Research Experience for Undergraduates (REU)**
  - Encourage participation by sophomores to provide experience at important transition point.

- **ASA DataFests**
  - Active Learning Opportunity which introduces students to employers, graduate faculty, and graduate students.

- **B/I/G Math Network**
  - Partner
  - Highlights opportunities and alternatives to graduate school.
Education Groups

• **Statistics Education Section:** This section promotes the teaching and learning of statistics by offering opportunities for all teachers. Teachers include academics, K-12 teachers, as well as informal or formal education in a professional context like business, journalism, medical research, consulting, and policy making.

• **Isolated Statisticians Outreach Group:** The Isolated Statisticians (ISs) is a collection of academic statisticians, each of whom is usually the only statistician (or one of two) in a mathematics department.

• **Caucus of Academic Representatives:** The purpose of this caucus is to promote the statistics discipline within the academic community and provide resources for academic statisticians to successfully advocate for the discipline.

• **Joint Committees**
  - ASA/MAA
  - ASA/AMATYC
Upper Division Pathways

Michael Boardman
MAA-CUPM
TPSE
Baltimore, MD
June 14, 2017
• Undergraduate curriculum

• Contributors
  • College faculty from
    • Two-year colleges
    • Four-year colleges & universities
    • Research universities
  • Steering committee (10 Individuals)
  • CUPM
  • Approximately 180 total
2015 CUPM Curriculum Guide

- Overview
- Course reports
- Program reports
- Beyond the curriculum
CUPM Curriculum Guide – Program Reports

- Actuarial Mathematics (Updated 2017)
- Applied Mathematics
- Chemistry and Mathematics
- Computational Sciences and Supplement
- Engineering
• Environmental Science and Climate Sciences
• Financial Mathematics
• Mathematical Biology
• Operations Research
• Physics and Mathematics
CUPM Curriculum Guide – Program Reports

• Social and Behavioral Sciences

• Statistics

• Teachers, Mathematical Preparation of Pre-service High School

• Teachers, Mathematical Preparation of Pre-service Middle School
EXAMPLE
Environmental Science and Climate Studies

• Foundational Courses
  • Mathematical Modeling
  • Data Analysis, Statistics, and Probability
  • Numerical Analysis/Operations Research
  • Programming

• Other Recommendations
  • Field course experience (learn where real data comes from)
  • Quantitative courses outside mathematics (to see how other actually use and perceive mathematics and mathematical methods)
  • Technical communication
  • Internship
  • Capstone/Senior project (interdisciplinary)
**Cognitive Recommendation 2:** Students should learn to link applications and theory.

**Cognitive Recommendation 4:** Students should develop mathematical independence and experience open-ended inquiry.

**Content Recommendation 3:** Mathematical sciences major programs should include concepts and methods from data analysis, computing, and mathematical modeling.

**Content Recommendation 5:** Students majoring in the mathematical sciences should experience mathematics from the perspective of another discipline.

**Content Recommendation 8:** Students majoring in the mathematical sciences should work, independently or in a small group, on a substantial mathematical project that involves techniques and concepts beyond the typical content of a single course.
2015 CUPM Curriculum Guide

- Updates coming
SIAM and Upper Division Pathways

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Clarkson University
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Former SIAM VP for Education, Chair of SIAG on Applied Math Education, and Director of *Modeling across the Curriculum*
Projects

• Emphasis on multidisciplinary team work
• Multidisciplinary in content and team make up
• Modeling
  • Not just “traditional” science-based (aka DE-based)
  • Data derived, or data-driven, models
  • Statistics
• Scientific Computing
• Internships
Computational Science and Engineering

• SIAM CSE conferences have had a strong components of
  • undergrad and grad pedagogy
  • undergrad research presentations/ SIURO*

• SIAM Education committee help in establishing such programs
  • Provides pathways to applied math for students in other “math-heavy” disciplines

*SIURO: SIAM Undergrad Research Online Archival publication outlet
Data Science: the new paradigm for multiple pathways?

- DESE might be the new CSE –
  - Data-enabled science and engineering

- Note a new blog advertised through SIAM/ED:
  - Karl Schmitt (Valparaiso U)
  - [https://blogs.valpo.edu/datadesk/](https://blogs.valpo.edu/datadesk/)
    concerns designing/creating undergraduate data science programs and courses

- To join the google group send an email to: [data-desk-blog-announcements+subscribe@googlegroups.com](mailto:data-desk-blog-announcements+subscribe@googlegroups.com)
Reports

• Research & Ed in CSE: [https://arxiv.org/abs/1610.02608v2](https://arxiv.org/abs/1610.02608v2)
• Modeling across the Curriculum:  
Noteworthy new program: Applied Math major at BYU (Jeff Humpherys)

Activities & Community Building

- Activities
  - Student Advisory Council
  - Pi-Day
  - Career Seminar
  - Integration Bee
  - Undergrad Colloquium
  - AMC exams, banquet
- Programs for Students: IMPACT/CSUMS, REU, Putnam, Math Club
- Outreach and Marketing: fliers, major fairs, video screen, documentary
- WeUseMath.com
- A lounge and several research labs so that majors have places to work and hang out

Improvements

- Improved Courses/Teaching: “intro to proof” revamp
- New applications courses
  - Crypto
  - Math Finance
  - Math Biology
  - Operations Research
- Cooperation with double majors, increase in minors
- TAs and extra office hours for key upper division courses
- New Computation Seminar
- Better, Coordinated Advisement