ICHM Co-Sponsored
Special Sessions on the History of Mathematics
Joint Mathematics Meetings
6-9 April 2022

This set of lectures comprised a two-day Special Session on the History of Mathematics by the American Mathematical Society at the Joint Mathematics Meetings. These meetings were originally planned for 5-8 January 2022 in Seattle, WA (USA), but were instead presented virtually 6-9 April 2022 because of COVID-19 restrictions in effect across the country. The session was organized by Sloan Despeaux (Western Carolina University), Jemma Lorenat (Pitzer College), Deborah Kent (University of St. Andrews), and Daniel Otero (Xavier University), and featured 10 speakers from the United States and the United Kingdom. The three sessions (7 April, morning and afternoon, and 8 April, morning) included talks on a variety of subjects and time periods.

The following talks, with accompanying abstracts, were presented at the meeting:

Richard Abe Edwards (Michigan State University), *(Not) Green's Theorem: The Curious History of a Theorem and its Pedagogical Implications*.

In 1828 the English mathematician George Green (1793 -- 1841) published "*An Essay on the Application of Mathematical Analysis to the Theories of Electricity and Magnetism*." In this *Essay*, an unknown miller from Nottinghamshire established the first mathematical theories of electricity and magnetism, introduced potential functions, and laid the foundation for later work by Maxwell, Thompson, and others. One thing Green did *not* do in his 1828 essay was discuss the theorem that now bears his name. In this talk, we explore the treatment of Green's Theorem in several 19th century manuscripts including "*On Integrals that Extend Over All of the Points of a Closed Curve*" (Cauchy, 1846) and "*Foundations for a General Theory of Functions of a Complex Variable*" (Riemann, 1851). In addition to being a fascinating story of how mathematical truth is established over time, the evolution of Green's Theorem provides compelling reasons for instructors to incorporate primary source texts in the undergraduate mathematics classroom.

Julia Tomasson (Columbia University), *The 'Quaestio de certitudine mathemaricarum,' Ibn Rushd and Islamic Mathematics*.

The so-called 'Quaestio de certitudine mathematicarum' debate of the sixteenth and seventeenth centuries is a rich site of inquiry for those interested in the early modern exact sciences, the history of mathematical proof, and the cultural history of mathematics more broadly. In the Quaestio, mathematicians—mostly associated with the University of Padua—argued whether the discipline of mathematics could claim that mathematical proofs are 'certain' in an Aristotelian logical framework, and if not, what types of proofs ought mathematicians to use to ensure certainty. While this debate is framed as a reckoning with Aristotle, the first citation in the first sentence of the first tract of the debate (Piccolomini, 1547) was not to Aristotle but to the Muslim polymath Averroes (Latin name for Ibn Rushd, 1126--1198 CE). Moreover, much of the debate is a discussion of Latin commentaries on Averroes' interpretations of Aristotle. Is this just a philosophical or rhetorical connection? Many Ottoman scholars were training at the University of Padua at this time. How did this effect the culture and practice of mathematical learning, teaching, and research? Were there similar debates happening in Arabic commentaries of Averroes work on mathematics and philosophy of mathematics that we might include in a more robust history of the Quaestio?

Maria R Zack (Point Loma Nazarene University), *Barbaro and Vitruvius: A Mathematician's Translation of an Architectural Text.*

Marcus Vitruvius Pollio, known as Vitruvius, was a first century BC Roman architect and engineer best known for his work *De architectura*. This multi-volume text discusses standard architectural forms in the ancient world. Vitruvius' work was "rediscovered" in the sixteenth century and was one of the books that fed the interest of symmetry and classical forms in European architecture, particularly in the work of architects such as Andrea Palladio. The cleric, architect, and student of mathematics, Daniel Barbaro translated *De architectura* into Italian in 1567. Vitruvius' original text contained almost no calculations, however Barbaro's commentary on *De architectura* contains a variety of mathematical topics. This talk will look at some of the mathematics in Barbaro's version of Vitruvius.

Brigitte Stenhouse (University of Oxford), *Choosing to publish a `popular' work: Three books by Mary Somerville advocating for analytical mathematics in 1830s Britain.*

In her 1831 book *Mechanism of the Heavens*, Mary Somerville actively promoted the adoption of analytical methods both to mathematicians and to those natural philosophers who were not mathematically literate. She argued that a true understanding of physical astronomy --- the motions and shapes of the planets, moons, and comets --- could only be reached by those who understood mathematical analysis. However, although she continued to publish articles and books on the physical sciences, none of Somerville's subsequent works spoke directly to mathematicians nor did they prioritise mathematical questions. This is somewhat surprising considering that Somerville had explicitly depicted analytical mathematics as a fertile ground waiting to be farmed. In this talk I will give an overview of two book-length manuscripts first written by Somerville in the 1830s --- one a volume on the form and rotation of planets, the other an analytical work on curves and surfaces. Somerville evidently spent large amounts of time on these technical manuscripts, which include hundreds of hand-drawn diagrams, but in 1834 they were left by the wayside and she instead brought a survey of recent scientific advancements to press in which all the mathematical formulae had been removed. By considering the market for mathematical books at the time, alongside Somerville's place in the scientific community as a self-educated woman, I will demonstrate why these manuscripts remained unfinished and unpublished.

Brittany Carlson (University of California, Riverside), *Villainizing the Woman Mathematician in Nineteenth-Century Literature.*

The nineteenth-century ushered in a wave of villainizing mathematics and mathematicians. While popular printed media villainized a few masculine figures for their superior mathematical abilities, such as the infamous Professor Moriarty, the overwhelming majority of villainized nineteenth-century mathematicians were women. In this talk, I will survey various literary sources that defile the reputation of women mathematicians. For example, Charles Dickens's *Hard Times*, Charles Kingsley's *Hypatia*, and George Bernard Shaw's *Mrs. Warren's Profession* portray successful women mathematicians as cold and calculating, incapable of feeling love and acquiring true happiness when, in reality, the only thing these women are incapable of is adhering to nineteenth-century gender norms. Studying this literary archive exposes many anxieties about women mathematicians. Acknowledging and understanding these anxieties about the historical woman mathematician is vital for understanding why women were barred from mathematical study and are still minoritized in the field today.

Karen H Parshall (University of Virginia), *Topology in 1930s America: A Tale of Two "Camps."*

By the 1930s, two rival "camps" of topology had evolved in the United States: point-set topology animated by Robert L. Moore at the University of Texas and combinatorial (or algebraic) topology fostered by Oswald Veblen and, especially, Solomon Lefschetz at Princeton. This talk will sketch the contours of the American topological landscape in the decade before the outbreak of World War II and highlight the differences and divisions between the adherents of the two approaches as they jockeyed for influence within the American mathematical research community.

Shoo Seto (California State University, Fullerton), *Kentaro Yano (1912-1993) and Tadashi Nagano (1930-2017) : Two Geometers and Their Works.*

Kentaro Yano is today remembered for his contributions on geometric structures on differential manifolds, mostly published after 1947. His first doctoral thesis was written under Elie Cartan's coordination before 1938 and inspired a lifelong direction of research including differential geometry on complex and almost complex spaces, or integral formulas in Riemannian geometry, among other topics. Besides an impressive body of mathematical work, Kentaro Yano was interested in writing for large audiences, and we will describe his interest and his books written in Japanese. Tadashi Nagano defended his doctoral dissertation under Kentaro Yano's supervision at University of Tokyo in 1959 and became a very influential and respected geometer. His body of work includes 10 papers written with Shoshichi Kobayashi. We will present his life and work, his recognitions and his lasting influence. Our presentation concludes with an overview of the volume *Differential Geometry and Global Analysis. In Honor of Tadashi Nagano*, edited by B.-Y. Chen, N.D. Brubaker, T. Sakai, B.D. Suceavă, M. Sumi Tanaka, H. Tamaru, and M.B. Vajiac, to appear as Vol. 777 in the *Contemporary Mathematics* series of the American Mathematical Society (expected to be released in 2022).

Nuh Aydin (Kenyon College), *The Need for Including the History of Islamic Mathematics and Science in School Curricula*

Based on research on primary sources since the middle of the twentieth century, we now know that some of the most fundamental notions of modern mathematics and science come from the medieval Islamic Civilization. Moreover, modern researchers also discovered that Islamic science was highly influential on Renaissance scholars such as Copernicus. Unfortunately, these findings did not become common knowledge over the decades and they are generally not included in the school curricula. In addition to academic research on primary sources, another area of great need in this field is the inclusion of accurate information on the role and contributions of the Islamic Civilization to mathematics and sciences. A Eurocentric narrative of science that presents a distorted picture is dominant in school curricula and in society. Part of the reason for the general lack of knowledge on this topic is the fact that prospective teachers do not learn about this material during their education. This combined with the general lack of inclusion of Islamic contributions to sciences in official curricula results in the current state of affairs. Therefore, the inclusion of this material in school curricula and teacher training and education programs is an important need that needs attention. The purpose of this talk is to draw attention to this need, exhibit some sample activities and resources that can be useful, and to invite the larger community to develop strategies to achieve this goal.

Thomas L Drucker (University of Wisconsin—Whitewater), *John Horton Conway as Historian*

John H. Conway was one of the most creative mathematicians of the second half of the twentieth century. His death during the pandemic was a loss to the mathematical community, even if his ill health had recently limited his ability to take part in its activities. Fortunately, he was able to see the publication of Siobhan Roberts's biography of him (Genius at Play, 2015), a tribute both to his accomplishments and his distinctive personality. This talk will present a view of Conway's attitude toward history and some of the strong feelings he had about issues from Greek mathematics forward. It is based on conversations, correspondence, and published work of Conway.

Amy Ackerberg-Hastings (MAA Convergence), *HoM Toolbox: Historiography and Methodology for Mathematicians*

How and where do mathematicians learn to research and write history? How easily can they find out about current methods and discussions by historians of mathematics and science? *MAA Convergence* is helping address both questions with a new article series that will give an overview of professional practice in history and provide examples of how historians of mathematics have applied specific methods and theories of historical interpretation. The initial installment considers:

1. What is history? Why should readers want to research and write it well?
2. How do we know about the past?
3. How do we create history based on what we know about the past?
4. What is the history of the history of mathematics?
5. How can readers articulate their own philosophies of the history of mathematics?

This talk will focus on the fifth activity as an exercise that not only encourages researchers, educators, and students to consume quality scholarship in the history of mathematics but also calls them to join the effort to produce original research in this field. I will end the presentation by asking for audience feedback on what mathematicians new to the endeavor need to know to research and write the history of mathematics.