ICHM Co-Sponsored Special Sessions on the History of Mathematics

Joint Mathematics Meetings, Baltimore, Maryland (USA)

18-19 January 2019

This set of lectures comprised a two-day Special Session on the History of Mathematics at the Joint Meeting of the American Mathematical Society and the Mathematical Association of America held in Baltimore, Maryland, USA. The session was organized by Sloan Despeaux (Western Carolina University), Jemma Lorenat (Pitzer College), Daniel Otero (Xavier University) and Adrian Rice (Randolph-Macon College), and featured 23 speakers from the United States, Canada, and the United Kingdom. The three sessions included talks on a great variety of subjects and time periods.

The following talks, with their abstracts (which include the dates the abstracts were received before the meeting) were presented at the meeting:

Serenus' Sections of a Cylinder and Sections of a Cone.
Colin B. P. McKinney, Wabash College

Serenus (4th century CE) wrote a now-lost commentary on the *Conics* of Apollonius, along with two works on sections of a cone and of a cylinder. In this talk, I will detail my preliminary work translating and analyzing the texts, and discuss their relationship with Apollonius' text and the broader ancient Greek mathematical corpus. (Received September 24, 2018)

The mathematics of eclipse diagrams in Sanskrit astronomy.
Kim Plofker, Union College, NY

One of the few details we know about the professional incentives of medieval Indian mathematician-astronomers is that it was important to them to predict eclipses. The *parilekha* or eclipse diagram was a crucial part of this particular form of "public engagement with science", and depended on several ingenious mathematical techniques in areas ranging from simple trigonometry to numerical approximation. This talk discusses how such diagrams were devised and used to showcase the professional achievements of mathematicians. (Received September 25, 2018)

Cracking Al-Kāshī's Tables.
Elizabeth Cornwall, University of Canterbury/Dixie State University

During the 14^{th} century, the Persian astronomer and mathematician al-Kāshī wrote his influential *Khāqānī Zīj*, an astronomical work consisting of tables and accompanying text. Among the many astronomical tables contained in this work, al-Kāshī presented several tabulating trigonometric quantities including some devoted to the "shadow", numerical data mathematically equivalent in many respects to the modern day tangent function. This presentation investigates these 'tangent' tables, detailing how they were laid out and to be used, the broader context in which they were understood, as well as the more complex question of how the numerical data they contain was computed. (Received September 21, 2018)

Max Dehn in America.

Marjorie Senechal, Smith College

Max Dehn (1878 - 1952), the first to solve a problem (#3) on Hilbert's famous list, is remembered for Dehn invariants, Dehn surgery, Dehn twist, etc., and for his long-running, influential mathematics history seminar at the University of Frankfurt. His dramatic escape from Nazi Germany across Siberia and, eventually, into the mountains of North Carolina, is the stuff of published legend and, in some quarters, pity. But papers in the Dehn collection at the Briscoe Center for American History at the University of Texas, Austin, and the archives of the five very different American colleges and universities in which he taught give a fuller and more nuanced picture of that journey – and of Dehn himself. (Received August 28, 2018)

Newton Has a Headache but Clairaut Makes it Go Away.

Lawrence Arthur D'Antonio, Ramapo College of New Jersey

Newton's headache was his failure to compute the motion of the moon using his universal theory of gravitation. In particular Newton was not able to account for the rotation of the lunar apsides. In this talk we will see how Alexis Clairaut, after trials and tribulations, was able to solve this problem. We will discuss Clairaut's initial failure, his proposal to modify the inverse-square law of attraction, the subsequent dispute with Buffon, and the final success in 1749 using a clever iterative calculation. Newton's headache would surely have cleared up, if Newton were still alive. (Received September 22, 2018)

Edward Hatton's Mercantile Mathematics.

Duncan J. Melville, St. Lawrence University

The expansion of trade and industry in late 17th-and early 18th-century England required increased numbers of clerks schooled in basic arithmetic and the arts of double-entry bookkeeping. Among those serving the new educational market was Edward Hatton (1664–1737), prolific author of some dozen works, many of which went through multiple editions, in some cases for a good sixty years after his death. In this talk I give a survey of his work illustrated with examples of his style and content. (Received September 22, 2018)

Moral Arithmetic: Decisions, values, and the likelihood of death from the Count de Buffon.

Dominic Klyve, Central Washington University

Buffon's work in mathematics has long been overlooked. His famous "needle problem", of course, is often mentioned, but this is presented more as a parlor trick than as a serious bit of mathematics. Buffon is best remembered today for monumental *Histoire naturelle, générale et particulière*, a 36-volume work in which he considered an astonishing range of subjects, from the behavior of animals to the weather. However, Buffon was also the author of a fascinating text on mathematics – his *Essai d'Arithmetique Morale* (Essay on Moral Arithmetic). In it, Buffon treated a range of topics, including an experimental study of the St. Petersburg game, an early treatment of utility theory, and range of problems in geometric probability. This talk will survey Buffon's work and attempt to put his many ideas in their historical context. (Received September 24, 2018)

Analysis and Synthesis in A.-M. Legendre's Éléments de géométrie.

Amy Ackerberg-Hastings, Independent Scholar

My 2000 dissertation and subsequent work explored how three different understandings of the terms "analysis" and "synthesis"—as mathematical styles, as directions of proof, and as educational approaches—influenced Americans' choices of geometry textbooks for colleges in the early 19th century. Although it provided the basis for two of these books, the 1819 translation attributed to Harvard's John Farrar and David Brewster's 1822 translation that was co-opted by Charles Davies of the US Military Academy, I have never examined Legendre's 1794 geometry textbook with respect to how these three dichotomies operated in his 18th-century French context. This talk reports on my effort to conduct such an inquiry. (Received September 12, 2018)

Servois on Numerical Integration.

Robert E. Bradley, Adelphi University
Salvatore J. Petrilli, Adelphi University

In mid-1810s, the topic of numerical integration was hotly debated in the pages of the *Annales de Gergonne*. Christian Kramp (1760-1826) had published a paper in 1815 describing a novel method for estimating definite integrals, based on the Trapezoid Rule and an *ad hoc* extrapolation technique. This sparked a debate among Kramp, the editor Joseph Gergonne (1771-1859) and Joseph Bérard (1763-1844?). François Joseph Servois (1767-1847) entered the fray in 1817 with his *Mémoire sur les quadratures*, in which he resolved most of the issues under dispute by the other authors. In this talk, we will examine Servois' memoir, which is at turns a showpiece of the calculus of operations, a feat of numerical prowess, and a collection of philosophical observations and opinions, including his forward-looking attitude towards the utility of divergent series. (Received September 19, 2018)

Divergent Series near the turn of the 20th century.

Brenda Davison, Simon Fraser University

While Euler and others of the mid-18th century had methods for assigning a value to some divergent series, the broad adoption of the Cauchy definition for the sum of a series made such objects problematic. However, by the mid-19th century, renewed interest in these series, as a result of their usefulness in physics, appeared at the hands of Stokes and Poincaré. This talk will examine the reasons for renewed interest in divergent series and the mathematics of summability and asymptotic series that developed in the period from 1880 through 1920, at the hands of Borel and Cesàro, among others, as a result. (Received September 24, 2018)

Notions of continua in E.V. Huntington's work.

Laura E Turner, Monmouth University

In the early years of the 20th century, Harvard mathematician E.V. Huntington (1874–1952) published a number of different sets of postulates defining the algebra of real quantities and the underlying linear continuum. In this talk, we explore his treatment of continua. In particular, we consider his discussions of Cantor's and Dedekind's definitions, and his mathematical and pedagogical motivations. (Received September 24, 2018)

Internationalize first, ask questions later: Headlong diplomacy and American mathematical hegemony, 1920-1950.

Michael J. Barany, University of Edinburgh

In 1920, American mathematicians first successfully bid to host an International Congress of Mathematicians in the United States, planned for 1924. They ultimately succeeded in hosting such a meeting on their third attempt, in 1950 in Cambridge, MA. Historians of American and international mathematics, most notably Karen Parshall, have given considerable recent attention to this period as a turning point for the international mathematical community and Americans' place within it. While it is tempting to emphasize Americans' noble ambitions and organizational triumphs in this period, their ignorance and blunders could be just as decisive for the particular kind of internationalism that emerged. Looking to international archives beyond the core institutional and personal sources typically used to understand these developments offers a striking view of these latter aspects of American internationalism. My presentation will explore Americans' headlong diplomacy, represented especially by the dramatic miscalculations of Marshall Stone, and its contexts and consequences for a globalizing discipline. (Received September 21, 2018)

Solving the "Shortage of Trained Brains": The Engineering, Science and Management War Training Program During the Second World War.

Brit Shields, University of Pennsylvania

With the outbreak of the Second World War, many US mathematicians, scientists and engineers began research work for the war effort. Those at universities also participated in one of the largest government-subsidized educational programs in US history. The Engineering, Science and Management War Training Program, funded by the US Office of Education, operated on over 200 campuses nationwide. The program included opportunities for students to train in engineering or for current engineers to gain new skills. This talk will discuss the role of the mathematical sciences within this program, focusing on how the courses developed at New York University. (Received September 25, 2018)

A Morsel from Euler.

William Dunham, Bryn Mawr College

Consider the infinite series:

$$\tan(\pi/4) + \frac{1}{2}\tan(\pi/8) + \frac{1}{4}\tan(\pi/16) + \frac{1}{8}\tan(\pi/32) + \frac{1}{16}\tan(\pi/64) + \cdots.$$

A comparison test easily establishes convergence, but determining the *exact* sum is not for the faint of heart. Who could possibly do such a thing?

The answer is Leonhard Euler. To find the exact value, he developed a peculiar trig identity and then employed logarithms, derivatives, and something he called "infinite numbers." The sum of this series, which is simple in form but far from obvious, provides striking evidence of Euler's mathematical agility.

This talk is for those who want to match wits with one of history's great mathematicians. (Received July 31, 2018)

Measuring Scouts and Trained Noses: Subjectivity, Objectivity, and the History of Mathematics.

Christopher J. Phillips, Carnegie Mellon University

There's a well-worn claim that gets made about the rise of mathematics in domains ranging from archaeology to medicine, policing to education: mathematics enables forms of trust in people to be replaced with trust in numbers. Put differently, numbers displace subjective knowledge with objective knowledge. While there are certainly historical exemplars of this transition, many skillfully documented by Theodore Porter and others, this talk focuses on another way mathematics has been used historically: to make the subjective objective. Focusing on baseball, enology, and medicine, I will show the ways mathematics did not replace human knowledge but rather enabled its marshaling into new forms of reliable knowledge. The history of mathematics' spread is not one of opposition to or displacement of human expertise; the concepts are in dialog with each other. The tools and technologies crucial to my examples are deceptively simple—scouting reports, rating cards, and medical records—and the mathematics hardly advanced—basic probability, sequential analysis, 2x2 tables—but the result has been a profound and often under-appreciated contribution to the ubiquity of mathematics in the modern world. (Received September 13, 2018)

The Bateman--Horn conjecture.

Stephan Ramon Garcia, Pomona College

The Bateman–Horn conjecture is one of the most significant and far-reaching conjectures in the theory of numbers. We discuss the conjecture and its origins, paying particular attention to original sources and first-hand accounts. (Received September 10, 2018)

Understanding the differential in the unpublished work of Mary Somerville (1780-1872).

Brigitte Stenhouse, The Open University, UK

In the early 19th century, the need to increase the acceptance and utilization of the differential calculus in Great Britain was keenly felt by a significant group of British mathematicians, who saw their contemporaries' reliance on the Newtonian fluxional calculus as a hindrance to research. Mary Somerville (1780-1872) was an active member of both the London- and Edinburgh-based communities of scholars who publicly advocated for the adoption of 'French analysis' (in a variety of its manifestations). In 1834, she completed a treatise on the differential calculus and its applications to geometry; with nomenclature borrowed from Lacroix, notation similar to that of Lagrange, and a conspicuous absence of Cauchian limits, the manuscript of this unpublished work provides a new and detailed insight into her conceptual understanding of a differential. Considering her central place in the British mathematical community, my talk will focus on the new perspective to be gained from this treatise, especially on the accessibility of, and contemporary attitudes towards, French ideas on the foundations of the differential calculus in 1830s Great Britain. (Received September 18, 2018)

A Cambridge correspondence class in arithmetic for women.

J J Tattersall, Providence College

In the late nineteenth century the Association for Promoting the Higher Education of Women in Cambridge began sponsoring a series of correspondence classes for women vying for certificates on the Cambridge Higher Local Examinations. These courses were designed for women who lived in remote areas devoid of suitable teachers and for governesses who did not have sufficient control over their time to permit them to attend classes or receiving oral instruction. In October that year, eighteen women enrolled in the arithmetic class organized by W.H.H. Hudson of St. John's College, Cambridge. The topics covered included measurement, vulgar fractions, ratio, proportions, decimal fractions, and interest. We discuss the contents of his correspondence to students that illustrate his educational philosophy, include tips on what books to consult, and his lessons on how to prepare for the examination. (Received September 16, 2018)

My Computing Device -- A Mathematical Perspective.

Peggy Aldrich Kidwell, National Museum of American History, Smithsonian Institution

Mathematically minded people in the United States have long invented, used in their work, and personally owned computing devices. Those most common in the early nineteenth century were educational aids such as the blackboard, the teaching abacus or numeral frame, and simple geometrical solids. At mid-century, some proposed and a few purchased machines that carried out arithmetic mechanically. These would be quite common by 1900, used to produce mathematical tables and to solve routine arithmetic problems. The handheld slide rule also became popular among mathematicians, engineers, and scientists. A few early twentieth century statisticians embraced tabulating equipment, while some number theorists devised their own machines and, at midcentury, embraced the newly invented mainframe computer. However, it would only be with the advent of microcomputers, often linked to linked to one another, that computers came to play a general role in mathematical research, communication, publication, graphics, and modelling. (Received September 23, 2018)

Magnificent Mathematicians in their Flying Machines.

Tony Royle, The Open University, UK.

The turn of the twentieth century heralded a revolution in humankind's attempts to master powered flight. Mathematics lay at the heart of a new genre of engineering that would be created by a cohort of exceptionally talented academics to underpin the venture. A number would take to the air, whilst others toiled on the ground in support. I will attempt a brief overview of the salient characters, institutions and mathematics intimately connected with this narrative in Britain during WW1. (Received September 22, 2018)

The Nautical Almanac Office harbors mathematical editors, 1849-1866.

Deborah Kent, Drake University

An 1849 Naval Appropriations Act authorized an official United States national almanac so American scientists and navigators would no longer need to depend on foreign sources for astronomical data. The U.S. Nautical Almanac Office was established not at the Naval Observatory in Washington, D.C, but in Cambridge, MA, specifically to have access to Benjamin Peirce's expertise and oversight for the calculating staff. The Nautical Almanac Office functioned as a crucial source of income and training for individuals who became centrally involved as editors and contributors to American mathematical periodicals. (Received September 24, 2018)

Aiming for High Standards: Solomon Lefschetz as Editor of the Annals of Mathematics.

Della Dumbaugh, University of Richmond

Solomon Lefschetz played a critical role in the American mathematical community in the early twentieth century. He contributed significantly to algebraic topology, its applications to algebraic geometry, and the theory of non-linear ordinary differential equations. He not only exhibited academic excellence in mathematics, but he also demonstrated leadership as a faculty member at the University of Princeton and as President of the American Mathematical Society. Lefschetz served as the main editor for the Annals of Mathematics from 1928 to 1958, an important period for the journal. During this time, it became an increasingly well-known and respected journal. Its rise, in turn, stimulated American mathematics. This work specifically looks at Lefschetz'a role as editor of the Annals, the papers that were published in the journal, the editorial boards, and the authors of the more than 1800 articles that appeared during his editorship. (Received September 24, 2018)