BRITISH SOCIETY FOR THE HISTORY OF MATHEMATICS

Research in Progress

Saturday 27 February 2016 in the Shulman Auditorium, The Queen's College, Oxford

Programme

10:30	Registration and coffee	
11:00	Welcome	
11:10	KEVIN BAKER University of Oxford	Did John Flamsteed read the *Principia*? The Astronomer Royal's understanding of Newton's method of first and ultimate ratios
11:50	ALESSANDRA PETROCCHI University of Cambridge	Sanskrit Commentarial Practices and Indian Medieval Mathematics
12:30	PHILIP BEELEY President of the BSHM	Award of BSHM Neumann Prize 2015 to Sydney Padua
12.35	SYDNEY PADUA London	Imaginary Engines—Visualising the Analytical Engine
13:05	Lunch in Magrath Room	
14:00	EDWIN REYNOLDS University of Southampton; winner of the BSHM Undergraduate Essay Prize 2015	Defining Continuity: Vindicating Cauchy
14:20	TONY ROYLE Open University	The Impact of the Women of the Technical Section of the Admiralty Air Department on the Structural Integrity of Aircraft during World War 1
15.00	Panel discussion	Translating mathematics
15:45	Refreshment break	
16:00	DR STEPHEN JOHNSTON University of Oxford.	*Invited lecture*: Becoming a Mathematical Practitioner.
17.00	Close of meeting	

Revised 23 February 2016

Abstracts

Kevin Baker

(University of Oxford)

Did John Flamsteed read the *Principia*? The Astronomer Royal's understanding of Newton's method of first and ultimate ratios

Despite its revolutionary status, there is very little evidence confirming who read the first edition of the *Principia* when it was published in 1687. Newton's conclusions depended on notoriously difficult mathematical proofs, and we know of no more than a handful of readers who followed them.

How did the results of the *Principia* come to be trusted, if so few people mastered its proofs? And in particular, why was the community of natural philosophers so quick to accept the validity of Newton's new mathematical method of first and ultimate ratios - the method of geometrical limits deployed in many of his proofs, which we now recognise as one of the early versions of the calculus?

John Flamsteed was one of the most prominent natural philosophers in England at the end of the seventeenth century. His personal copy of the first edition is in the archive of the Royal Society, and contains extensive marginal notes. I will argue that these annotations reveal that Flamsteed did verify many of Newton's traditional geometrical proofs, but did not engage critically with his new method of first and ultimate ratios: he must have had extra-mathematical reasons for trusting its validity.

Alessandra Petrocchi (University of Cambridge)

Sanskrit Commentarial Practices and Indian Medieval Mathematics

My paper discusses Sanskrit commentarial practices of mathematics in Medieval India. I shall present the mathematical work by the Śvetāmbara Jaina monk Siṃhatilakasūri (13th century CE). This is a commentary on the *Gaṇitatilaka* by Śrīpati, an astronomer-mathematician who flourished in the 11th century CE. Siṃhatilakasūri's text is a precious source of information on early Medieval mathematical practices. This is in fact the first Sanskrit commentary fully dedicated to Indian mathematics that seems to have survived to the present day and the first written by a Jaina that has come down to us. This work has never been studied or translated into English. After having briefly introduced Jaina religion and the importance of mathematics within its system of thought, I shall introduce some of the mathematical procedures found in Siṃhatilaka's work, with a particular emphasis on fractions.

Sydney Padua (London: Winner of the BSHM Neumann Prize 2015)

Imaginary Engines—Visualising the Analytical Engine

One hundred years before the first computers were built out of wires and transistors, the Victorian polymath Charles Babbage designed a gigantic steam-powered, punchcard-programmed, cogwheel computer, the Analytical Engine. His friend Ada, Countess of Lovelace, daughter of Lord Byron, completed some of the first programs for the machine, and theorised that one day it could be used for the manipulation of any kind of information. Unfortunately Ada died young and Babbage never built his Engine, leaving their story as one of the greatest what-ifs in the history of science.

A bit over 150 years later, I was procrastinating from my usual job as a visual effects artist by drawing a webcomic, *The Thrilling Adventures of Lovelace and Babbage*, in which the mechanical computer is finally completed and used to build runaway economic models, defeat spelling errors, and of course, fight crime. In my quest for more accurate comics I was dismayed to find that while the Analytical Engine was a staple of computer history 101 classes, no image of it, or clear explanation of how it worked, appeared to exist. So to my great disgruntlement I had to make one myself. In this talk I describe the process of making some of the first 3d visualisations ever created of the Analytical Engine, and present some animations of the operations of that extraordinary machine.

p.t.o.

Edwin Reynolds (University of Southampton)

Defining Continuity: Vindicating Cauchy

In the 1820s, Augustin-Louis Cauchy famously developed definitions for limits and continuity which were similar to the rigorous ones that we have today. But in fact Bernard Bolzano had given similar definitions several years earlier, and it has even been proposed that Cauchy saw and plagiarised Bolzano's work. With a lack of hard incriminating evidence against Cauchy, can we vindicate him? Assessing the influence of Lagrange's progress toward rigour will prove crucial in our quest to show that independent discovery is a highly plausible explanation. In the process, we will pin down the genesis of the modern definition of continuity.

Tony Royle (Open University)

The Impact of the Women of the Technical Section of the Admiralty Air Department on the Structural Integrity of Aircraft during World War 1

In 1917, as the air war raged in Europe, some of Britain's finest mathematicians, engineers and scientists engaged in their own battle to understand the fundamentals of aerodynamics and aircraft construction. Structural failure remained a significant concern of aviators, particularly during 'high-g' manoeuvres, and the ever-increasing horsepower of engines only exacerbated the problem. In the Ministry, Wg Cdr Alec Ogilvie led the technical section of the Admiralty Air Department, where a number of talented individuals worked on structural issues; amongst them were three women, Hilda Hudson, Letitia Chitty and Beatrice Cave-Browne-Cave, who will be the focus of my talk.

Panel discussion: Translating mathematics

Possible topics: literal or free? to modernise or not? is much mathematics lost in translation?

Dr Stephen Johnson (Museum of the History of Science, Oxford)

Becoming a Mathematical Practitioner

How and why should we study someone who worked out the mathematical basis of the Mercator map projection and went to sea on privateering expeditions, and yet who also carried out a programme of fundamental astronomical observation, translated Napier on logarithms, advised on magnetism, patented water pumps and acted as a surveyor for water supply? Edward Wright (1561–1615) did all these things and more, covering a range of activity that would now be identified as belonging to the distinct spheres of mathematics, science and technology.

For Wright however, they were all aspects of a single practical mathematical endeavour. How did he move from Cambridge student to London mathematical practitioner? And what do such career decisions tell us about mathematics and the early modern world? Taking Edward Wright as a case study opens up the realm of technique in an era usually seen more through the lens of the Scientific Revolution.

I also want to take the example of Wright as an opportunity for self-reflection. In sometimes surprising ways, my own experience as a museum curator has shaped the historical questions I have asked while following in the steps of such mathematical practitioners.

Revised 23 February 2016