BRITISH SOCIETY FOR THE HISTORY OF MATHEMATICS

Research in Progress

Saturday 23 February 2019 in the Shulman Auditorium, The Queen's College, Oxford

Programme

10:00	Registration and coffee	
10:20	BSHM	Welcome
10:30	BRIGITTE STENHOUSE The Open University	*Words Not Deeds: Analysis in the Work of Mary Somerville*
11:00	MICHAEL CHALMERS Sorbonne Université	*Georges Bouligand's Concept of Direct Methods in Mathematics*
11:30	KEVIN TRACEY London Science Museum & Swansea University	*Calculating Value: Exploring the Use, Collection, and Afterlives of Early Modern Mathematical Texts*
12:00	TOM RITCHIE University of Kent	*Re-Engineering History: A Playful Demonstration* [main demonstration during lunch break]
12:15	Lunch in the Magrath Room	
13:30	KEVIN BAKER Oxford University	*How To Read A Book You Don't Understand: John Locke's Commonplacing Routine and his Reading of Isaac Newton's* Principia Mathematica
14:00	JOSEPH BENNETT Institute of Technology, Carlow	*Henry Smith and the Arithmetical Theory of Forms*
14:30	NICOLAS MICHEL Laboratoire SPHERE (Université Paris-Diderot/CNRS)	*Lost in Translation: On the Rewritings of Chasles' Theory of Characteristics (1864–1880)*
15:00	Winner of the BSHM Undergraduate Essay Prize 2018:	
	KAMILLA REKVENYI St Andrews University	*Paul Erdős' Mathematics as a Social Activity*
15:20	Refreshment break	
15:50	NICCOLÒ GUICCIARDINI Università degli Studi di Milano	Invited lecture: *Anachronism(s) in the History of Mathematics*
17:00	Close of meeting	

Version of 25 January 2019

Abstracts

Kevin Baker (Oxford University)

How To Read A Book You Don't Understand: John Locke's Commonplacing Routine and his Reading of Isaac Newton's Principia Mathematica

The English philosopher John Locke has always played an important role in histories of early readers of the *Principia*. For three centuries he has represented the many well-intentioned individuals who tried to read Newton's book but couldn't understand it. Locke valiantly set out to hack his way through, so the story goes, but had to give up because he couldn't follow the mathematics.

In fact, this narrative misrepresents Locke's relationship with the *Principia*. Locke was a voracious bibliophile who kept meticulous records of everything he read, and had been trained in the Renaissance humanist tradition of commonplacing. His lifelong habit was to copy out short quotations from whatever he was reading into carefully-organised notebooks, dozens of which are now in the Bodleian Library, Oxford. They reveal that — although he skipped the mathematical proofs on each occasion — Locke read the *Principia* in full on three separate occasions, copying out brief excerpts from the text as he did so. Locke read Newton in exactly the same way that he read Cicero and Tacitus.

Furthermore, I will argue that this commonplacing routine necessarily obstructed Locke's engagement with the *Principia*. Because he habitually divided texts into discrete, isolated gobbets, his mode of reading could not assimilate an interconnected, coherent system such as Newton's. Even if he had possessed the mathematical expertise, the technology of Locke's notebooks would have prevented him from processing Newton's demonstrations. This Renaissance humanist custom was incompatible with seventeenth-century mathematical physics: Locke's reading of the *Principia* provides a vivid example of an outdated scholarly tradition unable to accommodate revolutionary new practices.

Joseph Bennett (Institute of Technology, Carlow)

Henry Smith and the Arithmetical Theory of Forms

Henry John Stephen Smith FRS (1826–1883) was Savilian Professor of Geometry at Oxford University from 1860 to 1883. He distinguished himself as a superb lecturer and researcher who brought international recognition to Oxford mathematics. His unique and caring personality ensured he was held in widespread affection and admiration by his students and the University community.

The mathematical writings of Henry Smith show an excellence and completeness, both as regards attention to details and accuracy of demonstration. His natural love of precision in thought was a result of his early study of the writings of Gauss, for whom he always felt the most unbounded admiration. In this talk I will assess the impact of Henry Smith's *Report on the Theory of Numbers* which he prepared for the British Association from 1859 to 1865. I would like to show how his further contributions to the Theory of Numbers remained true to the arithmetical spirit of Gauss's legacy.

Michael Chalmers (Sorbonne Université)

Georges Bouligand's Concept of Direct Methods in Mathematics

The concept of 'direct methods' in mathematics is strongly present in the mathematical and philosophical works of Georges Bouligand (1889–1979), first becoming apparent in his work on the Dirichlet problem in the early 1920s, and most explicitly in his later theory of 'géométrie infinitésimale directe', published in 1932. In brief, a direct method, for Bouligand, deals directly with the object or problem studied in a way that relies on a minimum number of hypotheses, preserves contact with intution and in some sense reveals the reason behind the result in question. He viewed direct methods as a major trend in the mathematics of his time.

In my talk, I will present Georges Bouligand's notion of direct methods as it appears and evolves in his own mathematical and philosophical works and I will attempt to go some way in situating his ideas in relation to those of other mathematicians such as Dedekind and Bourbaki.

Niccolò Guicciardini (Università degli Studi di Milano)

Anachronism(s) in the History of Mathematics

"The most usual ideological abuse of history is based on anachronism rather than lies." Eric Hobsbawm, *On History* (London: Abacus, 1998), p. 8.

"Is it permissible for an historian to describe past deeds and past works in terms that were not available to the agents themselves?" Nick Jardine, 'Uses and Abuses of Anachronism in the History of the Sciences', *History of Science* **38** (2000), p. 251.

Debate concerning anachronism has been long and vexed in historical interpretation. Forms of anachronism are often declared the greatest failure, almost a moral sin, that a historian can commit. Yet, many have spoken in favour of anachronism, considering it either as an inevitable, or even as a desirable feature of an historical work. Historians of science, and notably historians of mathematics, have debated this issue, sometimes in polemical terms (think of the debate concerning the notion of 'geometrical algebra' begun by Sabetai Unguru, or the quarrel over the applicability of non-standard analysis to the history of the differential and integral calculus). The purpose of this talk is to reflect on the 'use and abuse' of anachronism (to avail ourselves of Jardine's turn of phrase) in the historical study of the mathematical sciences. I shall give pride of place to Henk Bos's work on Descartes and Leibniz, since it provides a fruitful conceptual framework for critically coping with anachronism in the history of mathematics.

Nicolas Michel (Laboratoire SPHERE, Université Paris-Diderot/CNRS)

Lost in Translation: On the Rewritings of Chasles' Theory of Characteristics (1864–1880)

Over the course of the year 1864, through a series of public communications given during the weekly meetings of the Académie des Sciences, French geometer Michel Chasles (1793–1880) outlined his 'theory of characteristics', whose purpose was the enumeration of conic sections satisfying certain geometrical conditions. It immediately attracted a great deal of attention, as mathematicians from all over Europe praised its simplicity and the plethora of new results which could be derived therefrom. Several readers of Chasles' attempted to expand on these results in the following years; however, due to the nature of the texts through which his theory of characteristics had been made public, what was borrowed directly from Chasles by these readers was actually quite slim. Consequently, this rewriting, reconceptualizing and reinterpreting was carried out with significant leeway. Indeed, what we observe is the circulation of a small set of symbols and paradigmatic statements, literally identical amongst most mathematicians whose work was explicitly said to belong to, or to deal with, the theory of characteristics. Almost everything else surrounding this shared set of stable textual items, however, was subject to changes. This includes not only the mathematical tools used to prove, state, or explain theorems within the theory, but also the epistemological values attributed to one's version of the theory, the ontological status of the objects the theory handles, and, more surprisingly, the validity and truth-value of several, central formulas. These variations are, of course, inter-connected.

In this talk we set out to sketch three literary technologies through which this stable set of symbols was imbued with operative meaning, and we show how actors were led to reflect on the problematic identity of their theories. More precisely, we narrate this historical episode as the successive fabrication of three mathematical languages, with the chief aim to express general statements. By examining how inter-theoretical translations were conducted and how actors reflected on what these did to as ancient and stable an object as the conic section, we wish to illuminate the complex ways in which mathematical concepts grow and the role of their textual, concrete forms play in this process.

Kamilla Rekvenyi (St Andrews University)

Paul Erdős' Mathematics as a Social Activity

This presentation investigates the collaborative mathematical practice of Paul Erdős. It raises the question of whether communal mathematics, or mathematics as a social activity, can lead to individual success. It draws on new primary sources in both English and Hungarian.

I will look at Erdős's social mathematics from several angles. Firstly, I will analyse his collaborations and heritage, and the ways he had for finding the ideal mathematician to work with him on each problem. Then I discuss two contrasting case studies: his influence on young mathematicians as exemplified by Kenneth Falconer; and the Erdős–Selberg collaboration on the elementary proof of the prime number theorem, which ended in dispute. Neither of these collaborations resulted in individual success for Erdős, but both furthered, what may have been his main aim: solving beautiful mathematical problems.

Tom Ritchie (University of Kent)

Re-Engineering History: A Playful Demonstration

The purpose of this session is to discuss how Meccano — a child's toy and an engineer's tool — was used by Douglas Hartree to build an analogue computer — the Hartree Differential Analyser — in 1934, before stepping back in time to see it calculate once again.

Through physically reenacting the mathematical processes of mechanical integration, the session will explore the causes for the differences between the published accuracy rates of this model in contrast to others, challenging the socially-constructed nature of scientific-accuracy, and providing an alternative context of the history of computing.

The session will provide a better understanding of the wider historical and social context in which this model was rooted, providing a space in which to combine this context with the experiential aspect of creating computers. I rebuilt the working Meccano model as part of my Ph.D. to explore the social constraints and mechanisms of trust upon which Hartree's Meccano differential analyser depended, building on the work and ideas expressed in Otto Sibum's reconstruction of James Joule's 'paddle-wheel' apparatus.

The model sits at a unique intersection of historical research and educational engagement, creating and doing STEM via a historic hands-on method. I have used Meccano to recreate the Hartree Differential Analyser, providing a sensual and experiential opportunity to see historical engineering, mathematical, and computing techniques in 2019, exploring how the model works in reality and establishing the unconscious tacit knowledge that is required and derived from the intersection between amateur and professional science.

Brigitte Stenhouse (The Open University)

Words Not Deeds: Analysis in the Work of Mary Somerville

In 1831, Mary Somerville (1780–1872) completed an English adaptation of the early volumes of Pierre-Simon Laplace's *Mécanique Céleste*, in which she used the differential calculus to demonstrate the fecundity of mathematical analysis as applied to celestial mechanics. Somerville claims in her memoir *Personal Recollections* that in 1832 she completed an English adaptation of the later volumes as a manuscript entitled *On the Figure of the Celestial Bodies*. This was swiftly followed by an introductory, and thus complementary, 246-page work on the differential calculus titled *Theory of Differences*.

However, neither of these works was ever published. Although Somerville continued to advocate for the adoption of mathematical analysis through the publication of nine editions of her *Connexion of the Physical Sciences*, her purely analytical work was confined to the 'domestic sphere'. Using the extensive archival material held by Somerville College, Oxford (including extant manuscripts of the aforementioned works) and Girton College, Cambridge, I will present for the first time a detailed appraisal of Somerville's unpublished analytical works, in the context of the 19th-century British and French mathematical communities of which she was a member.

Kevin Tracey (London Science Museum and Swansea University)

Calculating Value: Exploring the Use, Collection, and Afterlives of Early Modern Mathematical Texts

Following the completion of my AHRC-funded Collaborative Doctoral Award research project into the mathematical holdings of the Science Museum, London's Rare Books Collection, this talk presents a 'Research in Review' wash-up. Drawing upon three uniquely-annotated texts, I will situate early modern mathematics and its readers in their appropriate historical, methodological and philosophical contexts, moving from a multi-edition *sammelband* used at the University of Wittenberg in the late sixteenth century to the European roots of the volvelles and paper instruments as presented in Thomas Blundeville's popular *Exercises* (1594). A detailed presentation of the use and preservation of John Seller's *Pocket Book* (1677) will then demonstrate how the transmission and reception of trigonometry and spherical astronomy were aided by early modern reading practices well into the eighteenth century. These examples will be supplemented by macroscopic data on the representativeness of the collection as a whole, and by examples of provenance markings illuminating the journeys these artefacts took to arrive at their present location.

Presenting the 'scribal technologies' utilised by early modern individuals, this paper seeks to shed further light on the intellectual methods such readers applied to their personal mathematical practice. Recent studies have begun to attend to the variety of mathematical user — and, indeed, the varieties of mathematical experiences a wide and some cases less-expert range of users met with. Despite this, our understanding of swathes of mathematical readers across early modern Europe remains fragmentary. This talk will present evidence of such previously unseen users, and suggest methodological pathways for their future identification.

Version of 25 January 2019