BRITISH SOCIETY FOR THE HISTORY OF MATHEMATICS

Research in Progress

Saturday 25 February 2023 in the Shulman Auditorium, The Queen's College, Oxford

Programme

10:00–10:20	Registration	
10:20–10:30	Welcome	
10:30–11:00	KATE HINDLE University of St Andrews	*Ancient Greek Impact on D'Arcy Thompson's Mathematics*
11:00–11:30	PARISA KHARAZMI Universidade de Aveiro, Portugal	*The Heptagonal Triangle: On the Crossroads of Constructive and Algebraic Geometry*
11:30–12:00	Refreshment break	
12:00–12:30	MIREIA MARTÍNEZ I SELLARÈS Utrecht University	*Affinities and Discrepancies: Euler and Möbius on Affine Figures*
12:30–13:00	MEGAN BRIERS University of Cambridge	*The Value of Women as Observers in the 1870 Eclipse Expedition*
13:00–14:00	Lunch in the Magrath Room	
14:00–14:30	TOM HEDLEY Trinity College Dublin	*Transforming Empty Spaces Modern Mathematics, Metamorphosis and "die neue Frau" in Mela Hartwig's* Bin ich ein überflüssiger Mensch? *(1931)*
14:30–15:00	ATLE BJARNE HÖHNE Martin-Luther-Universität Halle-Wittenberg	*Big Mathematics: CFSG and the Discovery of the Modern Sporadic Simple Groups*
15:00–15:15	Comfort break	
15:15–15:30	ZAKKAI GORIELY University of Oxford (BSHM Undergraduate Essay Prizewinner)	*British Mathematical Reformers in the Nineteenth Century: Motivations and Methods*
15:30–15:45	PATRICK BURCHELL Birkbeck University of London	*Archimedes:* On the Equilibrium of Planes
15:45–16:00	HOLLY MIDDLETON-SPENCER University of Newcastle	*Circulation of Mathematics in French Salons*
16:00–16:15	EMMA BAXTER University of St Andrews	*Soviet Mathematics Textbooks as a Reflection of 1930s Stalinist Culture*
16:15–16:45	Refreshment break	
16:45–17:45	ISOBEL FALCONER University of St Andrews	Invited lecture: *The Development of Curve Plotting: The case of J. D. Forbes (1809–1868)*
17:45	Close of meeting	

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Abstracts

Emma Baxter (University of St Andrews)

Soviet Mathematics Textbooks as a Reflection of 1930s Stalinist Culture

Sheila Fitzpatrick wrote that Stalinism was a "maximalist version" of the Soviet experience. Stalinist culture permeated all aspects of the private and public spheres of everyday life, including industry, farming, art, literature, and education. It was an ideology that aimed to build a new national history, culture, and identity. The most vulnerable, and perhaps important group to indoctrinate were the children, who constituted the future of the state. Stalinist ideology can even be found in Soviet mathematics textbooks for schoolchildren, and these textbooks demonstrate how deep-rooted the efforts to build a new Soviet nation and culture were.

In my talk, I will explore and contextualise some of the main ideological messages present in 1930s mathematics textbooks for children aged 7–12. First, I will focus on industrialisation, and in particular, the emphasis on productivity, the Stakhanovite movement, and the new Soviet 5-year plans (*pyatiletki*). I will then discuss the presentation of collectivisation and collectivised farms (*kolkhozes* and *sovkhozes*) as successful Soviet projects in the textbooks. Lastly, I will examine representations of women and gender in the textbooks.

References

Fitzpatrick, Sheila. *Everyday Stalinism: Ordinary Life in Extraordinary Times: Soviet Russia in the 1930s*, Oxford: Oxford University Press, 2000.

Megan Briers (University of Cambridge)

The Value of Women as Observers in the 1870 Eclipse Expedition

Increased mathematical precision in the 19th century meant that solar eclipse expeditions became regular features in the calendars of astronomers, as the location of totality could be predicted accurately enough to allow countries to send out parties to investigate properties of the corona. There were women accompanying all the British eclipse parties from 1842 until 1871 but despite the academic attention given to these eclipse expeditions, the role of women on the expeditions has often been left as an aside in accounts of the scientific aims of the predominantly male astronomers. Questions about the involvement of the women remain as basic as why they participated in the expeditions.

This paper will discuss the value of the women involved with the 1870 eclipse expeditions. This eclipse was chosen due to the quantity of archival material from the women involved and the instability of astronomy and eclipse expedition structure in 1870. Through assessing the roles of the women on the expedition, an argument is presented about the value given to women as objective observers in this period of astronomy.

Women were perceived to have an unbiased mind, due to a lack of astronomical knowledge. This perception, combined with their social standing, granted them some level of authority within the expeditions, and they were commonly involved with the verification of a male astronomer's observations. However, this lack of knowledge and ideas of limited intellectual capacities meant there was a strict ceiling on their participation, and their contributions of original observations were not respected.

Patrick Burchell (Birkbeck University of London)

Archimedes: On the Equilibrium of Planes

Archimedes' text on the lever is renowned for its enigmatic construction. Many authors, not least Dijksterhuis (1987), have commented on its redundant axioms for which no clear explanation can be given. More significantly the proof, for those who have studied it in detail, is held to be inconsistent for incommensurate magnitudes.

An argument is put forward to simplify the logical construction, by ignoring superfluous axioms, to achieve not only an elegant proof of the law of the lever but a throughline with pedagogic clarity. Additionally an alternative proof for non- commensurate magnitudes is offered that utilises observations from Euclid's Book 10 that would certainly have been available to Archimedes.

Isobel Falconer (University of St Andrews)

The Development of Curve Plotting: The case of J. D. Forbes (1809–1868)

When, in 2012, experimental evidence for the Higgs boson was announced, it came in the form of a curve with a blip, immediately understood by the audience. Yet 190 years earlier, in 1823, the practice of curve plotting was so unusual that S. H. Christie felt it necessary to explain not only the meaning of the curve for magnetic variation that he presented in the *Philosophical Transactions of the Royal Society of London* but also the process of defining the axes, representing the data as dots, and drawing the curve.

The development of curve plotting as a technique for relating observational data to mathematized theory appears to have been surprisingly difficult. Early promoters, such as Lambert, were not followed, and not until the 1830s did the method start to spread, following the work of Playfair and Quetelet in statistics, and Herschel and Forbes in natural philosophy (Beniger & Robyn 1978; Hankins 1999; Tilling 1975).

Tilling identifies a step change in the ubiquity of curve plotting among scientists, initiated by J. D. Forbes, Professor of Natural Philosophy at Edinburgh, Scotland, 1833–1859. Beginning in 1834, he used curves both to present and to analyse observational results relating to heat, meteorology, and glacial flow.

This talk discusses the evolution, prior to the 1830s, of the conceptual and material tools required for curve plotting. Based on an investigation of manuscript notebooks, the talk then takes Forbes as a case study that provides new insights into why the development of curve plotting may have been so difficult, and why, finally, it took off in the 1830s. Taking a multi-perspective approach, it discusses the role of curve plotting in Forbes' mathematized physics, his practices in plotting, and the influences on his use of curves. It argues that the wider acceptance of curves as a data visualisation was historically contingent on a much wider change in visual culture in the 1820s and 30s.

References

Beniger, James R., and Dorothy L. Robyn. 'Quantitative Graphics in Statistics: A Brief History', *The American Statistician* 32, no. 1 (1 February 1978): 1–11. doi:10.2307/2683467

Hankins, Thomas L. 'Blood, Dirt, and Nomograms: A Particular History of Graphs', *Isis* 90, no. 1 (1 March 1999): 50–80.

Tilling, Laura. 'Early Experimental Graphs', *The British Journal for the History of Science* 8, no. 03 (1975): 193–213. doi:10.1017/S0007087400014229

Zakkai Goriely (University of Oxford)

British Mathematical Reformers in the Nineteenth Century: Motivations and Methods

In the eighteenth century, a rift opened between the mathematical communities in Britain and the European continent, following the Newton–Leibniz controversy on the priority of the discovery of the calculus. By the early nineteenth century, several British mathematicians noticed the progress made by continental European mathematicians to which Britain had been blind.

This talk, following my prize-winning essay, will explore the methods these British mathematicians used in order to 'reform' British mathematics and introduce continental methods to the British isles, with focus on John Playfair's 1808 review of Laplace's *Traité de mécanique céleste*, William Wallace and James Ivory's contributions to the *Mathematical Repository*, and the Cambridge Analytical Society's 1816 translation of Lacroix's *Traité Élementaire*. Moreover, I will aim to show how, even though each group shared a similar reformist spirit, their motivations differed in significant ways which can explain the separate methods they utilised.

Tom Hedley (Trinity College Dublin)

Transforming Empty Spaces Modern Mathematics, Metamorphosis and "die neue Frau" in Mela Hartwig's Bin ich ein überflüssiger Mensch? *(1931)*

In 1923, the trailblazing mathematician Emmy Noether was granted a paid position in Göttingen — a recognition previously denied due to her gender and Jewish heritage. Now acknowledged as a figurehead of mathematical "modernism", Noether and some other radical colleagues, believed mathematicians were *artists* and not scientists. Can modern mathematics, therefore, be included in our discussions of modernism? Casting a wider net than mathematically-trained writers like Musil and Broch, I suggest isolating central concerns in modern mathematics, such as spatial transformation, in order to "re-read" corresponding manifestations in artistic modernism. In this paper I foreground Viennese modernist Mela Hartwig's *Bin ich ein überflüssiger Mensch?* [Am I a Redundant Human Being?] of 1931, a probing self-analysis of a young secretary in 1920s Vienna who casts herself (physically and psychologically) as an "empty space" that is continually re-sculpted by her various male love interests. This reflects the overarching sense of "transformation" associated with the modernist epoch, both in terms of the narrator herself and in the status of professional women in the early 20th century, often evoked by the tricky term "die neue Frau" ("New Woman").

One of the legacies of Noether and her contemporaries is the rethinking of transformation with an eye to its own opposite, namely *invariance*. In this new light, transformation becomes a tool to reveal its own counterweight. I argue in this paper that a more mathematically-aware perspective helps to uncover underlying continuities throughout the metamorphoses in Hartwig's novel: The supposedly amorphous nature of the protagonist exposes an invariant feminine agency, and the overarching paradigm-shift of "die neue Frau" ultimately reveals that which is not so "neu" after all — a continuity of gendered oppression in a new guise. In short, by zooming in on this theoretical overlap, this paper calls for a more mathematically-inclusive understanding of modernism as a whole.

Kate Hindle (University of St Andrews)

Ancient Greek impact on D'Arcy Thompson's Mathematics

D'Arcy Thompson (1860–1948), author of one of the first major biomathematical texts *On Growth and Form* (1917), is universally recognised in the literature for his interest in ancient Greece. He grew up able to read Greek fluently thanks to his father, a classicist scholar, and published several works throughout his life which translate and compile ancient Greek science.

This talk will focus on the impact that this interest in ancient Greece had on Thompson's relationship to mathematics, highlighting some of Thompson's mathematical works, and discussing how ancient Greek science may have inspired Thompson's cross-curricular study in biomathematics.

Atle Bjarne Höhne (Martin-Luther-Universität Halle-Wittenberg)

Big Mathematics: CFSG and the Discovery of the Modern Sporadic Simple Groups

The classification theorem of finite simple groups (CFSG) is one of the most enormous achievements of modern mathematics in the 20th and 21st century. According to one of its main contributors, Daniel Gorenstein, the proof of the classification "runs to somewhere between 10,000 and 15,000 journal pages, spread across some 500 separate articles by more than 100 mathematicians". The result of the classification is that every finite simple group is either cyclic of prime order, an alternating group of degree at least five, a simple group of Lie type or one of 26 so-called simple sporadic exceptions. While five of the sporadic groups had already been known by the dawn of the 20th century, all of the 21 groups in the title were found in the time period 1964–1975. By now, very little was done to write down the history and context of their discovery. We will look at the central mathematical ideas that led to the discovery of the first modern sporadic group, J_1, in 1964 as well as the social context of the related mathematicians. Similar research was done on further sporadic simple groups and will be discussed shortly.

Parisa Kharazmi (Universidade de Aveiro, Portugal)

The Heptagonal Triangle: On the Crossroads of Constructive and Algebraic Geometry

The historical development of mathematical sub-disciplines is sometimes clearly reflected in dealing with individual mathematical objects. At the same time, it provides us with knowledge of mathematical methods designed to solve problems and general advances in mathematical thinking. This also concerns elementary objects like polygons, which have been used since ancient times as motifs in decorative art, for example, in ornaments. But in general, polygons are only studied from the point of view of their construction with a straightedge and compass, following Plato's restrictions. However, other important properties, in particular their relationship to arithmetic and algebra, are often overlooked.

Our talk refers to a part of our study on the history of the heptagon based on the sometimes hidden seeds of the emergence of Algebraic Geometry from Constructive Geometry. This approach incorporates important historical aspects of Hellenistic mathematics, Persian geometry (Abu Sahl al-Kuhi, Abu al-Wafa Buzjani), and European mathematics into a common evolutionary framework. Of particular importance in this context is the heptagonal triangle (coined by Bankoff and Garfunkel 1973), which was already used by Archimedes, but without any justification. Indeed, the heptagonal triangle was only analyzed by Persian geometers, who applied it together with conics for obtaining an exact method of construction. We consider this essential point of turning away from the approximate to the exact construction of the heptagon in more detail.

Mireia Martínez i Sellarès (Utrecht University)

Affinities and Discrepancies: Euler and Möbius on Affine Figures

Euler introduced the geometrical notion of affinity between curves as a generalization of that of similarity in 1748. Almost 80 years later, Möbius took up the same notion in his *Barycentric Calculus* (1827). While crediting Euler with the definition of affinity, Möbius claimed that some of Euler's remarks about the properties of affinity relations between geometrical figures were erroneous.

In this talk, we examine Euler and Möbius' notions of affinity and explore the significance of their differences. From a present-day perspective, Möbius' definition is closer to the modern one, and his claim about Euler's statements being wrong can be construed as a valid critique of Euler's definition being dependent on a particular coordinate system. In this way, this disagreement is an interesting case study in the transition from classical computational to modern structural conceptions of analytic geometry, and sheds light on the (explicit and implicit) choices mathematicians make when coining new definitions.

Holly Middleton-Spencer (University of Newcastle)

Circulation of Mathematics in French Salons

I feel the full weight of prejudice that excludes us [*women*] *so universally from the science . . .*

If one is to asked to picture the Age of Enlightenment, they are likely to imagine erudite men crowded with a room in a western European country. One such epicentre of such an image was in Paris, where such endeavours not only centred in educational institutions but in more informal settings such as tea-rooms, coffeehouses and salons. With the ban on women entering the newly founded French Academy, it was the salon which provided a chance for wealthy, learned women to study and contribute towards the intellectual growth of the 17th–18th centuries. Prior discussions of French salons has historically focused on the literary and philosophical aspects. We instead bring the focus towards the role of the salon in the dissemination of new scientific research. This initiates the beginnings of a larger work on the mathematical progress during the peak of the French Enlightenment. In this talk we will introduce Marguerite de la Sablière, a woman famous in Paris for her understanding of mathematics and astronomy. We discuss her interactions with leading mathematicians and use her as a cornerstone for a wider study into the circulation of new mathematical theories and treatises in these more informal settings; such a work also aims to put a highlight on the affluent women who made the salons possible.

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