Titles and Abstracts (following the order of the conference schedule).

Day one (Thursday 1st August)

Niccolò Guicciardini, University of Milan.

Title: On two early editions of Isaac Newton's mathematical correspondence and works: William Jones's Analysis per quantitatum, series, fluxiones ac differentias (1711) and the Royal Society's Commercium epistolicum (1713).

Abstract: In the context of the priority dispute with Leibniz, Newton the mathematician went into the public sphere. In these two volumes, some of Newton's early mathematical correspondence and mathematical works were printed for the first time. I will describe the circumstances that led to these two publications, their making and their main features.

Yelda Nasifoglu, University of Oxford.

Title: Clavius and Compass: Mathematics education in early modern Jesuit colleges.

Abstract: Soon after its establishment in 1540, the Jesuit order underwent a period of rapid expansion. Education being a vital part of their mission, it became necessary to establish a consistently-applied curriculum, Ratio studiorum, for instruction in their schools and colleges. Initially mathematics was not included in this system beyond the foundational courses in the quadrivium, but building on his predecessor's efforts, Christopher Clavius (1538–1612) set out to ensure its full integration into the curriculum. Between c. 1581 and 1594, he produced various papers promoting the study of mathematics, codifying it in detail, and arguing for its importance for philosophy and the understanding of most physical phenomena. The final Ratio studiorum of 1599 incorporated Clavius's recommendations, and his mathematical textbooks, such as those in the Maynooth collection, became widely used in Jesuit colleges and beyond.

This paper studies Clavius's proposed mathematical curriculum and his arguments regarding the integration of mathematics and philosophy, also citing evidence from an early seventeenth-century academic comedy written in the Jesuit-run English College in Rome.

Catherine Goldstein, CNRS, Institut de mathématiques de Jussieu-Paris Gauche.

Title: Jean Prestet's Elements of mathematics: algebra as a basis for mathematics at the end of the 17th century.

Abstract: Although the idea of Elements of mathematics is usually tightly linked to that of geometry, early-modern authors also explored alternatives. Jean Prestet, a protégé of the philosopher Nicolas Malebranche, worked out a new basis for mathematics, one he

presented first as being largely Cartesian. After a short presentation of Prestet himself and his environment, the talk will discuss the various phases of his project and its two (or three …) editions. Prestet's emphasis on arithmetic and algebra pushed him to secure, through original proofs, what had been hitherto seen as "obvious" facts; to arithmetically explore symbolic expressions; and to renew and extend Diophantine analysis.

Boris Jardine, University of Cambridge.

Title: The Seven Ages of a Manual: Samuel Sturmy's Mariner's Mirror (1669), from conception to reception.

Abstract: Samuel Sturmy's Mariner's Magazine (1669) is a compendium of the mathematical arts in seven books, plus several appendices. It covers, in sequence: navigation, mathematical instruments, trigonometry, sea charts, surveying, fireworks, cosmography, dialling, logarithms, customs regulations, and fortification. In addition to a few dozen surviving copies of the four editions of the Mariner's Magazine, we are fortunate enough to have a fair copy, marked up for printing, of Book VII on the construction and use of sundials (Oxford History of Science Museum, MS Lewis Evans 101). Studying this manuscript alongside surviving copies of the book – especially annotated copies such as that held at the Russell Library – allows a glimpse of the way in which book production relates to reception, especially in the important issue of the interaction between text and image. More questions are raised than answered by this exercise – but these, it is hoped, are also of interest in understanding the tricky relationship between authors, publishers and readers of works of practical mathematics.

Philip Beeley, University of Oxford.

Title: TBC

Abstract: TBC

Benjamin Wardhaugh, University of Oxford.

Title: Reading Euclid in the Maynooth collection.

Abstract: Among the mathematical collections at Maynooth are half a dozen editions of the Elements of Euclid from before 1700, including several from the sixteenth century. They bear readers' marks which display the whole range of early modes of engagement with a mathematical text; they thus bear witness to readers who approached this most canonical of mathematical texts with pen in hand, active, engaged and even aggressive. These readers selected, emended and rearranged what they found on the printed page; they negotiated in detail with the book as to what exactly it should say and how it should say it, producing

customized versions of the Elements suited to their own needs: and recording for the historian their individual and idiosyncratic modes of mathematical reading. Furthermore, they used the white space of the mathematical page as a space in which to rehearse and perform their own understanding of the geometrical material they were learning, leaving a vivid trace of mathematical education as physical, manual and performative.

This talk will look at a selection of these marks from sixteenth- and seventeenth-century copies of the Elements, illustrating what they can – and cannot – tell us about the ways the Euclidean Elements were used in the early modern period.

***Kevin Tracey**, University of Swansea and the London Science Museum. (**unable to attend**).

Title: Ramus amongst the Jesuits: Reading Introductory Mathematics in the Irish Colleges of Spain.

Day two (Friday 2nd August)

Christopher Hollings, Mathematical Institute & The Queen's College, Oxford.

Title: Reading the Rhind Mathematical Papyrus.

Abstract: The Rhind Mathematical Papyrus is one of the major sources available to us on ancient Egyptian mathematics: it consists of 87 arithmetical and geometrical problems, grouped by theme; the papyrus is a compendium of different types of problems that would be encountered during a scribal career. Some parts of the papyrus were published in the later decades of the nineteenth century, but it was not until 1923 that a comprehensive edition finally appeared in print: that of Thomas Eric Peet (1882–1934), then Professor of Egyptology in Liverpool. Peet's edition remains the standard version of the text for Egyptologists, although a 1927 edition by Arnold Buffum Chace (1845–1932) has often been preferred by mathematicians. In this talk, I will consider the different requirements of these two groups of readers, and investigate how they each engaged with the editions of the papyrus. This study draws heavily upon material available in the Griffith Archive in Oxford, as well as a number of annotated copies of Peet's edition of the Rhind papyrus that are available in Oxford libraries; in these copies, we find marginal annotations of two clear types: those made by Egyptologists, and those of mathematicians.

Joseph Bennett, Maynooth University and Institute of Technology Carlow.

Title: Grand Prix des Sciences Mathématiques 1882.

Abstract: In February 1882, the Irish born mathematician Henry John Stephen Smith FRS (1826–1883) was surprised to see, in the Comptes Rendus, that the subject proposed by the French Académie des Sciences for its Grand Prix des Sciences Mathématiques was the theory of the decomposition of integer numbers into a sum of five squares. The competitors were directed to the results announced, without demonstration, by Eisenstein (1847). However, no mention was made of Henry Smith's own memoir dealing with the same subject in the Proceedings of the Royal Society in 1867, some fifteen years earlier. Henry Smith posthumously shared the Grand Prix des Sciences Mathématiques of 1882 with a young Hermann Minkowski. In this talk I will present some history, mathematics and letters which give detail to this curious episode.

Rod Gow, University College Dublin.

Title: Francis Hutcheson: an Irish-born philosopher with mathematical interests.

Abstract: Francis Hutcheson (1694-1746) was born in Co. Down and educated at Glasgow University, He then ran a school in Dublin for dissenters before becoming professor of moral philosophy at Glasgow until his death, which occurred during a visit to Dublin.

Hutcheson is well known in philosophical circles for his influence on prominent thinkers of the Scottish Enlightenment, such as Adam Smith and David Hume, as well as the anatomist and physician William Hunter. His writings and letters show that Hutcheson had considerable mathematical knowledge and interests, and his correspondents include Colin Maclaurin. Hutcheson was especially well acquainted with the work of his Glasgow colleague Robert Simson, professor of mathematics at the university.

Letters of Hutcheson mention Simson's research and personality. Of particular interest is an article Hutcheson wrote in 1735 for a Dutch journal, describing in some detail Simson's forthcoming book on conic sections (Sectionum conicarum libri V). This was Simson's first substantial contribution to his project of reconstructing the lost or misunderstood work of the ancient Greek geometers.

We intend to discuss Hutcheson's circle of acquaintances with a view to discovering more about the practice and circulation of mathematics, particularly geometry, in the first half of the 18th century, with reference mainly to Ireland and Scotland.

Peter Lynch, University College Dublin.

Title: George Gabriel Stokes's Fundamental Contributions to Fluid Dynamics.

Abstract: The 200th Anniversary of the birth of George Gabriel Stokes is on the 13th of this month. Stokes made fundamental contributions to many areas of mathematics. In particular, his work in fluid dynamics continues to have profound practical consequences.

The basic equations formulated by Stokes play a central role in numerical weather prediction, in the simulation of blood flow in the body, in aircraft design and in countless other important applications.

In this talk the primary focus is on the two most important areas of Stokes's work on fluid dynamics, the derivation of the Navier-Stokes equations and the theory of finite amplitude oscillatory water waves. The role of the Navier-Stokes equations in weather forecasting and climate modelling will be addressed.

Anne van Weerden, Utrecht University.

Title: A biographer's opinion as primary source: the strange case of Sir William Rowan Hamilton

Abstract: In the 1880s Robert Perceval Graves wrote a biography about Sir William Rowan Hamilton, filled with letters and personal notes, to which he gave comments. Yet it is not the content of Hamilton's letters and notes which survived in our collective memory. On only six or seven pages of the biography Graves uttered his strict Victorian and temperate opinions about Hamilton's `insidious habit' as he called drinking alcohol, about Hamilton's way of doing his mathematics, sometimes skipping meals and working through the night, and that Lady Hamilton should not have allowed him to do that. Graves was nuanced however; he also wrote that the gossip about Hamilton's use of alcohol was exaggerated, and that the Hamiltons remained attached to each other until the end. Nevertheless, taking Graves' criticisms as primary sources, and not regarding them in the context of their time, led to the contemporary ideas of an unhappy marriage and alcoholism. As an example I discuss the event at the Geological Society in February 1846 at which Hamilton allegedly became drunk. Even though Hamilton was told by people who were present at the dinner that he only drank a moderate quantity of wine, Graves chose to blame Lady Hamilton for the public humiliation.

Sue Hemmens, Marsh’s Library.

Title: The Bishop, the Knight, his Wives, and a Book: an Arabic Euclid from the collection of Narcissus Marsh.

Abstract: Marsh’s Library in Dublin was established by Narcissus Marsh (1638–1713) in 1707. Marsh’s own collection of mathematics texts is extensive, and his interest and knowledge is evident in his annotations, and in his diary. Among his books is an Arabic language edition of Euclid, published in Rome in 1594 with a commentary attributed to the thirteenth-century Persian polymath, Nasīr al-dīn al-Ṭūsī (1201–74). An inscription on the title page reads ‘Chr. Gardyneri’: a Greek motto appears below it. I have identified this as the signature of Sir Christopher Gardyner (1596–1662), a ‘good judicious gentleman in the

Mathematicke and other Sciences useful for Plantations, Kimistry, &c and also being a practicall Engineer', who travelled to the Massachusetts colony in the 1630s 'intending discovery' but was himself discovered living in a manner which scandalised his puritan neighbours. This colourful aspect of Gardyner's story has eclipsed an alternative view of him as 'such a reader, as I could wish all'. His personal library, including this Arabic Euclid, was dispersed, but such traces of it as are extant reveal a man of broad education and interests, including those in mathematics.

Clare Moriarty, University College Dublin.

Title: 'Reasons for Not Replying': A Masterclass in Trolling from an 18th Century Bishop.

Abstract: Bishop George Berkeley's most significant foray into mathematical history is well known. The publication of *The Analyst* in 1734 was met with a number of interesting responses--many of them from considerable contemporary figures like James Jurin and Colin Maclaurin. In the 20th century, his objections were also taken seriously by the founder of non-standard analysis, Abraham Robinson, as is evidenced by Robinson's considerable engagement with Berkeleyan worries in 'The Metaphysics of the Calculus' (1967).

One conspicuous feature of Berkeley's mathematical writings is his cantankerous rhetorical style. In many ways, the opening sections of *The Analyst* read more like a call to arms than a mathematical introduction. In this paper, I focus on a local case of Berkeley's mathematical invective by concentrating on Berkeley's testy exchange with Dublin mathematician J. Walton. I argue that Berkeley's epistolary engagement with Walton deploys mathematical rhetoric in a manner highly reminiscent of what we would now (in online contexts) call "trolling" behaviour. In *Reasons for Not Replying,* Berkeley deploys a bizarre strategy of combining terse arguments drawn from empirical thinking about classical mechanics and analysis with wink-wink-nudge-nudge mock-accusations of Newtonian sabotage.

Maurice OReilly, Dublin City University.

Title: Using original sources with undergraduate mathematics students: an exploration of the mathematical treasures in Marsh's Library.

Abstract: Between February and April 2019, six students taking mathematics on a joint honours BA programme at Dublin City University each worked on two books in the collection of Marsh's Library, Dublin (incorporated in 1707). Working with original sources is one way to enable students to encounter mathematics outside of the traditional textbook-style approach. It situates their engagement with the subject closer to its original conception, drawing attention to the people who struggled to break new ground in the intellectual, social and political context of their time. We present here how the students were supported in preparing two pieces for the Marsh's Library website, the challenges they encountered, and how their work was edited in preparation for online publication. The

twelve seventeenth century works considered begin with Galileo (1632) and end with L'Hospital (1696).

Gavin Hitchcock

Title: Fellowship of imaginations: A dialogue between Hamilton & De Morgan.

Abstract: We enlist other participants in a theatrical presentation aiming to bring to life the friendship and mathematical communion between William Rowan Hamilton and Augustus De Morgan, and to communicate a sympathetic understanding of these two mathematicians in their historical and social context. Narration and characters' speeches are based very closely on their writings and on their correspondence over the years 1841 - 1865. The dialogue highlights their mutual excitement in creating new algebras, and their joint grappling with the very nature of algebra, from sharing an initial youthful horror of the emergent symbolic algebra to acknowledging George Peacock's profound influence on their differently nuanced struggles to negotiate the tensions between signs and meanings, formalism and conceptualism. Their exchanges touch on very personal issues such as health, plagiarism, poetry, the pressures of public office, and the puzzle of why De Morgan's two close friends and correspondents, Boole and Hamilton, did not themselves correspond.

Piotr Błaszczyk, Institute of Mathematics, Pedagogical University of Cracow, Kraków.

Title: On how Descartes changed the meaning of the Pythagorean theorem.

Abstract: Euclid's Elements Proposition I.47 provides the ancient Greek version of the Pythagorean theorem (PT): the square on the side subtending the right-angle is equal to the [sum of] squares on the sides surrounding the right-angle. While the interpolation sum of characterizes modern translations, in the Greek mathematics, instead of sum of figures, there were rather references to figures themselves, as exemplified by the diorismas' part of the proposition: the square on BC is equal to the squares on BA, AC. (Clavius, 1589), one of the most popular seventeenth edition of The Elements, includes essentially the same version of PT. Therefore, we adopt the perspective that the following scheme ☐, ☐ = ☐ accurately represents pre-Descartes form of PT. In modern mathematics, PT is represented by the formula $a^2 + b^2 = c^2$, where a, b, c are real. While a^2 stands for the product of side length, and b^2, c^2 alike, in the Greek mathematics, the square on the side meant literally the square constructed on the line segment. We will show that (Descartes, 1637) includes yet another form of PT that is in between the ancient version and the modern one, namely $a^2 + b^2 = c^2$, with a, b, c representing sides (line segments) of a triangle. We will examine how the very formula is referred to diagrams representing right-angled triangles, and then will discuss Descartes' translation of excerpts from Pappus' Collection regarding the phrases square on the line and the square of the line.

References

Clavius, Ch., Euclidis Elementorum. Libri XV, Roma 1589.
Descartes, R., La Géométrie, Lejda 1637.
Heiberg, J., Euclidis Elementa, Lipsiae 1883–1888.

