



Correspondence of
John Wallis
(1616–1703)

VOLUME IV (1672–April 1675)

Philip Beeley and
Christoph J. Scriba

OXFORD



John Wallis, line engraving by David Loggan (1634–92), dated 1678

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The Correspondence of John Wallis

Volume IV
(1672–April 1675)

Editors

PHILIP BEELEY
CHRISTOPH J. SCRIBA

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Dedicated to the memory of
Joseph Ehrenfried Hofmann (1900–73)

PREFACE

Intellectual commerce in the 17th century, no differently from trade in commodities such as wine, silk, or sugar, was subject to forces dictated by geopolitical interests and rivalries, alliances, and conflicts. For more than half of the period covered by the fourth volume of *The Correspondence of John Wallis (1616–1703)*, the Third Anglo-Dutch War, which saw England fight alongside France, was waged on land and at sea. The conflict disrupted epistolary exchange between the British Isles and continental Europe. Longer times than usual elapsed between posting and receipt and more letters than usual failed to reach their destination at all.

Conflicts took place also through the medium of correspondence, sometimes mirroring those between nations. The publication of Huygens's *Horologium oscillatorium*, in which the Dutch mathematician reiterated his earlier claim that Hendrik van Heuraet had been the first to rectify any curve successfully, prompted Wallis to enlist the help of friends and fellow scholars to prove that this honour should go to the English mathematician William Neile instead. Neither Wallis nor Huygens was prepared to back down and thus reaching an impasse it was not long before their epistolary relationship, which had survived lesser moments of turbulence in the past, was finally ruptured.

Throughout his life, Wallis used correspondence to exchange information and engage in scholarly debates, and the first half of the 1670s is no exception. In order to maintain a degree of objectivity, letters were often addressed not to the intended recipient, but instead to an intermediary who was able to ensure that the communication reached its true destination. Thus the scientific amateur Francis Jessop, who lived near Sheffield, sent his reflections on Wallis's hypothesis of tides enclosed in a letter to his friend Martin Lister in York who forwarded them with a letter of his own to Henry Oldenburg in London. The secretary of the Royal Society in turn conveyed Jessop's reflections to Wallis in Oxford enclosed in the latest offering of his own. The Savilian professor followed suit by addressing his reply to Oldenburg, not to Lister or to Jessop himself. Moreover, this format was maintained throughout the correspondence of the two men.

Such epistolary practices make it necessary to extend the concept of what constitutes an item of Wallis's correspondence. The person to whom a letter is addressed is not always the true or intended recipient. This means, for example, that it is occasionally necessary to include letters sent to others, but which were in fact intended for Wallis. Nor is this the only circumstance where we consider an inclusive policy justified. Sometimes the existence of a letter can be established only through a reference found in an exchange between third parties. Occasionally such third-party exchange is our only source of a letter's content. In some cases, we have found it necessary to include letters in order to provide context to others or to make them comprehensible at all. This is especially true of Wallis's correspondence as *Custos archivorum* of the University of Oxford. Letters exchanged in the course of defending the University's ancient rights and privileges often assume far more than they themselves reveal. Not to provide epistolary context would mean rendering the background to Wallis's letters unnecessarily opaque.

The present volume contains in total 252 letters, of which 113 are from Wallis, while 124 are either addressed to him or he was the intended recipient. Of the letters contained in this volume, eighty-one have not been published before. All existent enclosures which were integral to Wallis's correspondence have been edited and are printed here. A further twelve letters have been included for contextual reasons or because they throw light on other letters for which no further evidence exists. In addition, three letters have been included in accordance with editorial policy to print all those letters neither from nor addressed to Wallis but which went through his hands at some stage and which were first published by him. The Savilian professor thus contributed decisively to their contemporary reception. Most letters in this category were originally published in the third volume of Wallis's *Opera mathematica*.

Part of the work in preparing this volume was carried out during the course of the Oxford-based project on John Wallis entitled 'Harmony and Controversy in Seventeenth-Century Thought', funded by the Arts and Humanities Research Council (AHRC) between 2007 and 2010. The editors should like to thank the AHRC for its generous support throughout the duration of that project. From September 2010 up to January 2013 the edition of the Correspondence of John Wallis was an integral part of the Cultures of Knowledge project, a collaboration between the Bodleian Libraries and the Humanities Division of the University of Oxford funded by The Andrew W. Mellon Foundation. Without the Mellon Foundation's generosity and farsightedness in supporting editorial projects of this nature the

timely realization of the present volume would not have been possible. To all concerned the editors wish to express their sincere gratitude.

A more congenial and intellectually stimulating environment in which to produce an edition of this nature than the History Faculty of the University of Oxford is scarcely imaginable. The editors should like to thank the Faculty for providing the edition with superb technical and administrative support. The proximity to the treasures of the Bodleian Library is an added but greatly valued advantage.

As with earlier volumes, the editors are in this case, too, aware that the success of their endeavours is dependent to a considerable extent on friends and colleagues who have been prepared, often at short notice, to check transcriptions, to assist with understanding historical context, suggest new commentaries or variant readings, and so on. Without the help and generosity of others, this volume could not have been produced to the standard it has achieved. Of course, any deficiencies which remain are wholly the responsibility of the editors.

We should like to thank particularly our close colleagues and friends at Cultures of Knowledge, namely Miranda Lewis, Kim McLean-Fiander, James Brown, and Anna Marie Roos, all of whom have followed the emergence of the volume at Oxford closely. Miranda Lewis has helped tirelessly in checking bibliographical details, proof-reading, and supplying all sorts of encouragement. Without her dedication to the aims of the Cultures of Knowledge project a large part of our editorial work would have been so much more difficult. Anna Marie Roos is to be thanked many times over for sharing generously with the editors her transcriptions of the correspondence of Jessop and Lister. Additionally, the editors would like to thank Moti Feingold, Michael Hunter, Vivienne Larmine, Noel Malcolm, Leigh Penman, Will Poole, Jason Rampelt, and Richard Sharpe for their advice and help on specific points. Per Landgren deserves a special word of thanks for the warm spirit of collaboration he brought to Oxford and for the assistance he has given on checking transcriptions.

The editors are especially grateful to Howard Hotson, the director of the Cultures of Knowledge project, for his tireless efforts in supporting the Wallis edition and for ensuring that it continues to flourish. Particular thanks go to Pietro Corsi, who has been ready to give thoughtful advice at all times, and whose moral support has been immeasurable. Jackie Stedall deserves special mention, for her steadfast support and for continuing to be such an inspirational voice in the history of mathematics in Oxford.

Siegmund Probst has, as always, been willing to share his profound knowledge and expertise on seventeenth-century mathematics with the

editors. A considerable amount of the early stages of editing was carried out by Uwe Mayer. More recently, Ellie Stedall has contributed to the progress of the edition by meticulously transcribing letters from manuscripts. The editors should like to thank all of these collaborators for their lasting contributions to the edition.

Once again, the editors take pleasure in thanking the Vogel Stiftung for its generous support in enabling us to obtain high quality digital images of letters from Cambridge University Library. In this respect particular thanks are due to Menso Folkerts who sponsored the editors' approach to that foundation.

The editors should like to express their gratitude and appreciation to the staff of the two libraries they have used most intensively during the preparation of the present volume: the Staats- und Universitätsbibliothek Hamburg and the Bodleian Library in Oxford. They wish to thank in particular Hans-Walter Stork of the manuscript department in Hamburg and Colin Harris, of the Bodleian Library's department of Special Collections.

This volume could not have been realized without the assistance and cooperation of librarians and archivists at numerous other institutions. The editors should like to thank especially Clare Hopkins, who made available for consultation the papers of Ralph Bathurst held in the archives of Trinity College, Oxford. Östlund Krister of the Universitetsbibliotek, Uppsala, has been willing always to provide expert help on manuscripts in that library's holdings. Jackie Cox, deputy Keeper of the Archives of the University of Cambridge has readily supplied us with information on that archive's seventeenth-century holdings. Andrew Mussell, archivist at Lincoln College, Oxford, has been extremely helpful in identifying former undergraduates of that college. Robert Athol has kindly provided access to the archival holdings of Clare College, Cambridge. Adam Perkins, curator of scientific manuscripts, has been generous in sharing his expert knowledge of the Newton and Collins papers held in Cambridge University Library. An special word of gratitude goes to the library of the Royal Society in London. Without the generosity of that marvellous institution in making its rich manuscript holdings available to scholars, publications like the present volume would not be possible. We wish to thank in particular Keith Moore and Rupert Baker for the thoughtful and qualified assistance they have given at all times.

Readers of this volume will note that substantial numbers of the letters and other documents it contains are housed in the archives of the University of Oxford. Without the unwavering support given by the Keeper of the Archives, Simon Bailey, the edition would not be able to appear in the form and breadth which it has. His generosity in placing the entire

seventeenth-century resources of the University Archives at the editors' disposal in order that nothing be missed, is truly remarkable. Not only have he and his assistant archivist Alice Millea been accommodating at all times, often at short notice, but they have also allowed the editors to draw on their palaeographical expertise and profound knowledge of the history of the University. The editors' indebtedness to the University Archives is quite simply immense.

The editors wish to express their gratitude to the following persons and institutions for granting permission to publish copyright material held in their possession: the Syndics of Cambridge University Library; the Librarian of the Bibliotheek der Rijksuniversiteit, Leiden; the British Library Board; Bodley's Librarian, University of Oxford; the Keeper of the Archives, University of Oxford; the Director of the Bibliothèque Nationale de France; the Royal Society; the National Archives, Kew; the Librarian of the Universitetsbibliotek, Uppsala; the Director of Det Kongelige Bibliotek, Copenhagen; the Director of the Koninklijke Bibliotheek, The Hague; the President and Fellows, Trinity College, Oxford, and the Librarian, University of St Andrews Library, St Andrews.

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Philip Beeley
Christoph J. Scriba
Oxford and Hamburg, July 2013

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INTRODUCTION

Economic reality and political ambition rarely coincided in Restoration England, and the period covered by the fourth volume of the *Correspondence of John Wallis (1616–1703)* is no exception. At a time when governments relied for income on individuals or consortia of individuals who would lend against the proceeds of a tax, rather than on direct taxation, the financing of immediate requirements often necessitated extraordinary measures. On 2 February 1672 (old style), in an act known as ‘Stop of the Exchequer’, originally proposed by commissioner of the treasury Thomas Clifford (1630–73), Charles II suspended repayment of the amassed government debt. With additional subsidies from his cousin, Louis XIV, arranged by secret treaty and specifically to this end, the king confidently embarked upon a new military adventure against the Dutch Republic. In the words of Gilbert Burnet (1643–1714/15): ‘Our court having resolved on a war, did now look out for the money to carry it on’.¹

The Third Anglo-Dutch War, in which England fought alongside France, lasted for almost two years at considerable human, material, and financial cost. Its end was precipitated by the threat of political crisis with parliament towards the close of 1673 increasingly unwilling to grant the king further supply. There was growing public disenchantment, too, fuelled particularly by the announcement of the marriage of Mary of Modena to the duke of York. Eventually the king’s hand was forced and the Treaty of Westminster was signed on 11 February 1674 (old style). That treaty would change the power vectors in Europe significantly, bringing an end to England’s alliance with France.

References to the economic consequences of England’s latest war with Holland are to be found throughout the present volume, from Christopher Wren’s (1632–1723) report to Wallis on newly introduced taxes, which also affected the two Savilian professors (No. 34), to efforts by the treasury at

¹ *History of His Own Time*, ed. G. Burnet, I, 560–1; D. Ogg, *England in the Reign of Charles II* I, 355; II, 448–9; J. K. Horsfield, ‘The “Stop of the Exchequer” Revisited’, 512–13.

the beginning of 1674 to meet a serious shortfall in the king's revenue by increasing the number of licensed taverns (Nos. 34, 168). As in earlier conflicts between nations, so too on this occasion, pamphlets and other publications were used to influence public opinion. A former fellow of Jesus College, Oxford, Michael Roberts (d. 1679), would cite lines from a Dutch gazette, widely distributed in Germany and elsewhere, in which England's war policy was attacked (No. 124). Soon a battle of a different kind, between Wallis and the Dutch mathematician Christiaan Huygens (1629–95), would sever forever the two men's long-standing intellectual ties.

Algebra and analysis

While the politics of war generally coloured the language of scholarly discourse in northern Europe, practitioners of the mathematical sciences displayed their own potential for conflict to a remarkable degree. Much personal honour, even national pride, was at stake, particularly in the emerging field of analysis, and a whole generation of exceptionally gifted mathematicians competed. The debate over the method of tangents in the early 1670s exemplifies this sense of competition and the often attendant traits of envy and suspicion. Possibly through the work of Evangelista Torricelli (1608–47), perhaps independently, René François de Sluse (1622–85) arrived at a method for finding the tangent to a curve whose equation is of the form $f(x, y) = 0$, where f is a polynomial. This rule was equivalent to one devised by Jan Hudde (1628–1704); neither of these had been published, although both had been known on the continent since the end of the 1650s. On reading Isaac Barrow's (1630–77) *Lectiones opticae et geometricae*, published in 1669, Sluse recognized that the tangent method it contained was closely related to his own, and wrote about this to Henry Oldenburg (1618?–77) on 22 November 1670 (new style), stating that 'monachos, tangent, maxima and minima, are one and the same thing'.² By February 1670/1, Sluse had received news of James Gregory's (1638–75) general method of tangents, and suggested to Oldenburg that it might be the same as his own, 'at least if he followed in the footsteps of the distinguished Barrow'.³ After hearing

²SLUSE–OLDENBURG [12]/22.XI.1670; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, VII, 251: 'Ut verbo absolvam $\mu\omicron\nu\alpha\chi\omicron\varsigma$ tangens, maxima et minima, unum idemque sunt'.

³SLUSE–OLDENBURG [27.II]/9.III.1670/1; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, VII, 480–1: 'Methodum ipsius tangentes ducendi eandem esse cum mea suspicor, saltem si Clarissimi Barrovii vestigiis institerit'.

also that Isaac Newton (1643–1726/7) had devised a method to find tangents and was working on topics such as infinite series, Sluse responded by declaring his intention to publish his own method in the near future.⁴

More than a year went by before this intention was carried out and Sluse's 'short and easie method of drawing tangents to all geometrical curves' appeared in the *Philosophical Transactions* for January 1672/3. During this time the evident concern arose in English mathematical circles that they might again be found wanting. Newton, like John Collins (1625–83), recognized that Sluse had a good understanding of a method of tangents already at the time of publishing *Mesolabum* (No. 88).⁵ Collins evidently alerted Wallis to the latest developments at the beginning of 1672 (Nos. 8, 9). In his letter to Gregory of 14 March 1671/2 (old style), he tells the Scottish mathematician that he has mentioned to Wallis Sluse's intention of publishing his 'method de Maximis et Minimis et tangentibus Curvarum', and that this has prompted Wallis to send up 'his owne Notions about the same'.⁶ Wallis's 'Epitome binae methodi Tangentium', sent in the form of a letter to Henry Oldenburg, was subsequently published in the *Philosophical Transactions* for March 1672 (Nos. 17, 27, 33).⁷ Collins gives a short account of developments in a contemporary letter to Edward Bernard (1638–96), who already at this time was deputizing for Wren as Savilian professor of astronomy (No. 24).

Wallis's aim in publishing his two methods was not only to anticipate Sluse, but also to present in a more compendious way ideas he had developed in earlier book publications such as *Arithmetica infinitorum* and *Tractatus duo*. After the article had appeared, Oldenburg sought to promote further discussion by asking Christiaan Huygens to examine Wallis's methods.⁸ In his response to Oldenburg's request, Huygens asserted that Wallis's second method had been known to him earlier through the work of Gilles Personne de Roberval (1602–75). Although Wallis had made no claim to originality, he became embroiled in another dispute over priority in discovery, albeit one which was short-lived (Nos. 49, 60).

Towards the end of 1672, Newton expressed, in a letter to Collins, his pleasure that foreign mathematicians had happened upon the same method

⁴See SLUSE–OLDENBURG [17]/27.XII.1671; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, VIII, 401–7, 406.

⁵Cf. NEWTON–OLDENBURG 23.VI/[3.VII].1673; *The Correspondence of Isaac Newton*, eds. H. W. Turnbull, J. F. Scott, et al., I, 290–5, 294.

⁶COLLINS–GREGORY 14/[24].III.1671/2; *James Gregory*, ed. H. W. Turnbull, 224–5.

⁷Cf. J. E. Hofmann, *Prioritätenstreit*, 72–4.

⁸OLDENBURG–HUYGENS 8/[18].IV.1672; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, IX, 11–12; WALLIS–OLDENBURG 2/[12].X.1672.

of tangents as his own. However, he was at the same time convinced of the greater generality of his approach: ‘This Sir is one particular, or rather a Corollary of a Generall Method’.⁹ As he explains, his method extends ‘without any troublesome calculation, not onely to the drawing tangents to all curve lines whether Geometrick or mechanick or how ever related to streight lines or to other curve lines but also to the resolving other abstruser kinds of Problems about the crookedness, areas, lengths, centers of gravity of curves &c.’ In contrast, other methods were decidedly limited: ‘Nor is it (as Huddens method de maximis et minimis & consequently Slusius his new method of Tangents as I presume) limited to æquations which are free from surd quantities. This method I have interwoven with that other of working in æquations by reducing them to infinite series.’

Oldenburg communicated the substance of Newton’s letter to Collins in his to Sluse dated 29 January 1672/3 (old style).¹⁰ In the meantime, Sluse’s ‘short and easie method of drawing tangents to all geometrical curves without any labour of calculation’ appeared in the January issue of the *Philosophical Transactions*, having been read to members of the Royal Society at their meeting on 29 January 1672/3 (old style).¹¹ At that meeting, Oldenburg was ordered to ask Sluse for a demonstration of his method, which was eventually published in the June issue of the journal.¹² As already mentioned, Oldenburg responded to Sluse’s initial publication by sending him details of Newton’s method of tangents, as described to him by Collins.

The beginning of 1673 is of crucial importance for the later dispute over priority in discovery of the calculus, for the German scholar Gottfried Wilhelm Leibniz (1646–1716) was at this time visiting London. At the meeting of the Royal Society on 22 January 1672/3 (old style), he presented the model of his still unfinished calculating machine.¹³ He also attended the meeting the following week, where he met Robert Moray (1608–73) and heard Sluse’s letter expounding the Belgian mathematician’s method of tangents. Leibniz evidently paid considerable attention to the mathematical part of the proceedings and brought back to Huygens in Paris

⁹NEWTON–COLLINS 10/[20].XII.1672; *The Correspondence of Isaac Newton*, eds. H. W. Turnbull, J. F. Scott, et al., I, 247–52, 247–8.

¹⁰OLDENBURG–SLUSE 29.I/[8.II].1672/3; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, IX, 427–8.

¹¹*The History of the Royal Society*, ed. T. Birch, III, 74; *Philosophical Transactions* No. 90 (20 January 1672/3), 5143–7.

¹²‘Illustrissimi Slusii methodus, quo demonstrat methodum suam ducendi tangentes ad quaslibet curvas absque calculo’, *Philosophical Transactions* No. 95 (23 June 1673), 6059.

¹³*The History of the Royal Society*, ed. T. Birch, III, 73.

a copy of the latest issue of *Philosophical Transactions* containing Sluse's 'Short and easie method'.¹⁴

In late summer 1673, Sluse wrote to Oldenburg, asking if he knew of anyone who had demonstrated Paul Guldin's (1577–1643) rule of centrobarics relating to convex curved surfaces and whether any such demonstration had been published (No. 108).¹⁵ The secretary of the Royal Society immediately conveyed Sluse's question to Wallis, who—without Guldin's *Centrobaryca* to hand—responded by setting out examples of the calculation of the volume of bodies generated by revolution, as contained in the notebooks he had written in 1651 and 1652 (Nos. 112, 113). His justification for replying in this way was that 'a learned gentleman' had described his approach to tangents as being similar to that employed by Guldin. He also admitted to having been unable to find the rule of centrobarics in the volume of Guldin's work held in the Bodleian Library in Oxford. Sluse subsequently showed that the centrobaric rule as applied to curved surfaces can be demonstrated easily, the application to solids having been demonstrated already by Bonaventura Cavalieri (1598?–1647). Wallis's reply is remarkable not so much for his approval of Sluse's demonstration as for his confession that he had never examined Cavalieri's so-called method of indivisibles directly, but had extracted it instead from the writings of Torricelli—evidently unaware of the differences between the methods of the two Italian mathematicians (Nos. 139, 140).

Scarcely had emotions calmed over competing methods of tangents, when an old dispute over priority in discovery was re-ignited through the publication of Huygens's *Horologium oscillatorium* in 1673. Ostensibly the second edition of a work published fifteen years earlier, the five part *Horologium oscillatorium* incorporates a wealth of discoveries and mechanical designs which Huygens had developed in the meantime. After introducing his theory of evolutes, in the third part, and specifically after elucidating their role in the rectification of the semi-cubical parabola, Huygens sets out the history of earlier rectifications from his perspective. Not only does he thereby declare Hendrik van Heuraet's (1633–60?) rectification of the semi-cubical parabola to be superior to that of William Neile (1637–70), but also claims that it was he himself who first discovered the dimension of a parabolic curve from the given quadrature of a hyperbola. In fact, all

¹⁴Cf. OLDENBURG–LEIBNIZ 30.I/[10.II].1672/3; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, IX, 431; A. R. Hall, 'Leibniz and the British Mathematicians', 138.

¹⁵SLUSE–OLDENBURG 3/[13].IX.1673; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, X, 178–9.

the evidence suggests that van Heuraet and Huygens made their discoveries independently of one another, and that Huygens effectively bullied van Heuraet into ceding any claim on priority.¹⁶

Wallis rejects the charge of bad faith levelled against him by Huygens, maintaining that he had no reason to favour Neile, who was almost unknown to him at the time. To doubts about the authenticity of Neile's discovery in the absence of a contemporary publication, Wallis points to there being living witnesses, members of the then nascent Royal Society including Christopher Wren and William Brouncker (1620?–84), who were still able to testify that Neile had presented his demonstration 'in 1658'. At the time of writing, Wallis was away from his papers in London and made an error regarding the year. Claiming for his part that Neile's discovery was derived from proposition 38 of the *Arithmetica infinitorum*, Wallis concludes with a bold statement on the value placed on scientific glory by him and his contemporaries in England, suggesting that whatever might be thought about the French or the Dutch, 'certainly the English are not thus given to continual pursuit of fame' (No. 86).¹⁷ As evidence of this supposed intellectual modesty, Wallis cites the example of William Harvey (1578–1657), whose discovery of the circulation of the blood had been known and accepted for some twenty years before it appeared in print.

In a subsequent letter to Oldenburg, written after his return to Oxford, Wallis supplied the correct date of Neile's discovery and asked Oldenburg to convey this correction to Huygens. Oldenburg carried out this instruction just a few days later (No. 90). Having not himself been present at Gresham College in the summer of 1657, when Neile set out his discovery, Wallis asked Collins to make enquiries among those living mathematicians who were (No. 116). Both Brouncker and Wren confirmed in writing the nature and circumstances of Neile's proof, although Wallis was evidently instrumental in the drawing up of their narrative accounts. Their letters, together with one written by Wallis himself to the same purpose, were published in the *Philosophical Transactions*, Oldenburg's journal thereby constituting a public forum to underwrite and confirm the priority claim on Neile's behalf (Nos. 117, 118, 119, 134).

While earlier quarrels between Wallis and Huygens had been resolved amicably, this occasion proved to be different. Faced with an orchestrated campaign against him, Huygens suggested that the English were no less

¹⁶J. G. Yoder, *Unrolling Time*, 120–4.

¹⁷'Quicquid enim de Gallis, aut etiam Batavis, putandum sit; certe Angli non solent ita semper esse gloriabundi.'

covetous of praise than the French or the Dutch and ceased all further communication with the Savilian professor (Nos. 94, 166). After conducting more than twenty years of scientific correspondence, Wallis blamed Huygens for its final breakdown. In truth, neither man was entirely blameless.

Other disputes of earlier years continued to overshadow scientific debate. On hearing of certain questions on number theory which Jacques Ozanam (1640–1718) had posed to Leibniz during his sojourn in Paris, Wallis reiterated the position he had come to adopt on such mathematical challenges: that anything worthy of knowledge should be published openly rather than the author willfully engaging others in such exercises (No. 74). Hearing that Bernard Frenicle de Bessy (1605–75) was preparing a new work on number theory, the *Traité des triangles rectangles en nombres*, which was eventually published in 1676, Wallis expressed concern that his long letter to Brouncker of August 1668,¹⁸ a copy of which had been sent to Henri Justel (1620–93), might be used to his disadvantage. Wallis suggested that Oldenburg ask Justel politely to return the copy (No. 161).

Not all of Wallis's discussions on mathematical themes in the early 1670s were potentially or actually contentious. In September 1674, George Fairfax (*fl.* 1674–1701) a teacher and practitioner of mathematics then living in Oxford, asked for the Savilian professor's assistance in understanding the rule of combination contained in William Buckley's (d. 1569) *Arithmetica*. Wallis, who tells us elsewhere that he delivered public lectures on combinatorics at Oxford in 1671 and 1672, proceeded to explain Buckley's rule, pointing out that it applies solely to prime numbers. Fairfax evidently found Wallis's reply satisfactory, for he subsequently turned his attention to questions on projective geometry instead (Nos. 184, 185, 186, 187).

If the surviving letters are to be believed, Wallis's epistolary exchange with Fairfax was of short duration and thematically focused. The contrast to his ongoing correspondence with Collins could not therefore have been greater. Alongside the London intelligencer's news of recent developments in the mathematical sciences, reports of new books and discoveries, announcements of planned publications such as that of Sluse's method of tangents, the two men discussed at length techniques for resolving algebraic equations. In this context, Wallis provides his most detailed account of the circumstances in which he carried out his first serious work on equations and how he happened upon rules for extracting the roots of cubics which he subsequently found to be equivalent to those established earlier by Geronimo

¹⁸WALLIS-BROUNCKER VIII?1668; *The Correspondence of John Wallis (1616–1703)*, eds. P. Beeley and C. J. Scriba, II, 573–92.

Cardano (1501–76) (Nos. 79, 80). In particular, he recalls how he established this equivalence when he first encountered the *Géométrie* of René Descartes (1596–1650), noting that the rules he found there were without any demonstration. At Collins’s request, Wallis gives an account of his original and subsequent work on resolving biquadratic equations to cubics, and also develops ideas on questions of algebraic notation (Nos. 79, 81, 82, 83, 85). In another letter to Collins, Wallis demonstrates his rule for resolving biquadratic equations, after Collins’s former colleague at the Excise Office, the mathematical practitioner Nicholas Gunton (*fl.* 1670–3), had had difficulty understanding it (No. 116). When Pieter van Schooten (1634–79) asked to be informed of the mistake which Thomas Merry (*c.*1605–82) had identified in Jan Hudde’s (1628–1704) method of resolving compound equations, Wallis referred the request to Collins because of the latter’s personal acquaintance with the English algebraist. Once again, it was a question of what knowledge might be rightfully placed in the public sphere. Wallis felt that Merry should be required to give explicit permission for the mistake to be revealed to van Schooten. Commensurate with his generally held views on publication, Wallis at the same time suggested to Collins that Merry’s tract on Hudde’s rules, which had already been circulated in English mathematical circles in manuscript, might be printed with John Kersey’s (1616–77) book on algebra which was then at the press in London (Nos. 75, 79).

Mathematical publications

As a mathematical intelligencer, John Collins regularly supplied Wallis and others with extracts of letters he had seen or received himself. Sometimes, too, he copied out particularly pertinent extracts from books he had obtained and read. In this way, his correspondence served as an important medium for disseminating the work of men like Newton and James Gregory who were less than forthcoming themselves (Nos. 24, 79).

Alongside epistolary commerce, books were an important part of the dissemination and exchange of mathematical knowledge in the early modern era, as Wallis had recognized and expressed in his inaugural lecture at Oxford in October 1649. But this was an intellectual trade which held such financial dangers that few London booksellers were able to offer anything more than the most meagre selection of books from the continent. Conventional trade routes had to be bypassed and, on numerous occasions, Wallis joined forces with Collins in sending large quantities of books from English and Scottish presses to the continent in exchange for required titles from booksellers in Leiden, Paris, Lyon, or Palermo. Collins would then ensure that those

books arriving in London and destined for Wallis were duly repackaged and conveyed to Oxford (No. 20).

Collins also used his excellent connections to the London book trade to get a number of book projects off the ground or to assist in their realization. The scholarly assessment of the rationale of such publishing endeavours often came from Oxford. Thus while the London intelligencer informed both Wallis and the acting Savilian professor of astronomy, Edward Bernard, of his efforts to get the algebraic textbook written by John Kersey into print, they assisted him by reporting on the value of Kersey's work. By the time printing of *The Elements of that Mathematical Art commonly called Algebra* was already well under way, Collins turned his attention to new publication plans. Just as Wallis supported the printing of Merry, so, too, was he prepared to contribute with a long-planned algebraical work of his own. On one occasion he writes to Collins, 'I shall not be wanting as to my part when there is occasion; & am well pleased that others are so forward in order to it: I wish we find not a stop at the Presse; which we meet with too often in Mathematick Books' (Nos. 60, 78, 79).

While the Merry project was never realized, and Wallis's work on algebra did not finally leave the press until 1685, two years after Collins's death, other enterprises were more successful. By the end of 1672 plans were well advanced for the publication of Isaac Barrow's (1630–77) Latin compendium of books I–IV of Apollonius's *Conics*. As in the case of Kersey, Collins asked Bernard to write a review of the proposal for the bookseller, Robert Scott (in or before 1632–1709/10) (No. 60). With the assistance of Scott, Collins also sought to persuade Wallis to assist in the realization of the compendium by supplying abridgments of Archimedes's *Mechanics* and Pappus's *Collection*. The Savilian professor, who was probably already at this time intending to produce critical editions of a number of classical mathematical texts, declined the request for lack of time and leisure to complete the work (Nos. 182, 183).

Collins was also a key figure in the completion of another project, Wallis's edition of the scientific papers of Jeremiah Horrox (Horrocks) (1618–41), despite having played no part in its conception. On 16 March 1663/4 (old style), Paul Neile (Neale) (1613–86) had brought a copy of some of the English astronomer's papers to a meeting of the Royal Society.¹⁹ Wallis, who was present at that meeting, was asked asked to peruse the papers with a view to publication—a task he carried out with the Savilian professor of astronomy, Christopher Wren (1632–1723). With the aid of original Horrox

¹⁹ *The History of the Royal Society*, ed. T. Birch, I, 395.

papers procured from John Worthington (1618–71) and Jonas Moore (1617–79), replacing the poorly transcribed copies supplied earlier by Neile, Wallis was able to finish much of the editorial work by the end of the year and plans for the envisaged form of publication emerged. Repeated attempts to obtain council’s approval were however unsuccessful, and when approval was finally received and the manuscript submitted to the printer, he ‘first deferred, and after declined the printing of it.’²⁰

In the light of these failures at realization, the Danzig astronomer Johannes Hevelius (1611–87), who had been kept abreast of the Royal Society’s plans, was asked to consider publishing some of the Horrox papers. Although Hevelius agreed, at the beginning of 1669, this proposal faltered, too, because the draft edition which had already been submitted to the London printer John Martyn (1617/8–80) could not be traced at the time.²¹

It was not until 1672 that plans for the Horrox edition were restarted. Up until then, Wallis had continued to pursue with interest the question of the fate of the English astronomer’s papers.²² It is probable, too, that part of what became the epistle dedicatory of the published edition had been printed before 1672.²³ News of Worthington’s death, in 1671, prompted Wallis to remind Collins that the extracts he had prepared for publication were with the mathematical intelligencer in London. Collins had at some stage between 1669 and 1672 succeeded in tracing the missing book manuscript; for a time it had been with Wallis in Oxford for revision (No. 9). Preparations for publication were soon underway. During the process of printing, Collins regularly sent Wallis proof sheets for correction. As numerous letters show, the astronomer John Flamsteed (1646–1719) was also heavily involved. Not only did he contribute material of his own, but he also influenced the final composition, not always to the satisfaction of Wallis (Nos. 37, 38, 40, 41, 42, 53, 54, 60).

While the edition of Horrox’s *Opera posthuma* suffered repeated delays and required a considerable number of years from conception to completion, many other mathematical book projects in the second half of the seventeenth century were less successful. Prominent among such failures was the proposed Latin edition of Gerard Kinckhuysen’s (1625–66) *Algebra ofte*

²⁰ WALLIS–OLDENBURG 24.IV/[4.V].1669; *The Correspondence of John Wallis (1616–1703)*, eds. P. Beeley and C. J. Scriba, III, 167–8, 168.

²¹ HEVELIUS–OLDENBURG [11/[21]].III.1668/9; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, V, 440–2, 441.

²² WALLIS–WOOD 10/[20].III.1669/[1670]; *The Correspondence of John Wallis (1616–1703)*, eds. P. Beeley and C. J. Scriba, III, 324–7, 326.

²³ COLLINS–BERNARD 16/[26].III.1670/1; *The Correspondence of John Wallis (1616–1703)*, eds. P. Beeley and C. J. Scriba, III, 431–5, 432.

Stel-konst. By late 1666, Collins had persuaded two London printers, John Martyn and Moses Pitt (1639–97), of the value of publishing the whole or part of the work, the translation having been prepared by the German-born mathematician Nicolaus Mercator (1620–97). Pitt was at first inclined to append selections from Kinckhuysen to Thomas Brancker’s (1633–76) English translation of Rahn’s (1622–76) *Teutsche Algebra*, but when that work came off the press, in 1668, it did so without any such additions.²⁴

Following this set-back, Collins outlined to Wallis his new proposal, to combine the publications of the whole of Kinckhuysen’s *Algebra* with excerpts from another Dutch book he admired, Johan Jacob Ferguson’s (c.1630–91?) *Labyrinthus algebrae*. It was suggested that Wallis might be required to advise or even assist on the project. Evidently, Collins had the backing of the Royal Society, for an announcement of this proposed ‘Introduction to Algebra’, which ‘by the encouragement of some of the R. Society’ had been translated into Latin and ‘fitted for the Press’, appeared with a review of Ferguson’s original work in the *Philosophical Transactions*.²⁵

Probably in order to strengthen his case for publication, Collins sent a copy of Kinckhuysen’s *Algebra ofte Stel-konst* with Mercator’s translation through the hands of Isaac Barrow, the first holder of the Lucasian chair in mathematics at Cambridge, to his future successor, Newton. Another copy without the translation was sent for review to the mathematical practitioner Thomas Strode (d. 1697). Besides revising the translation, Newton was inspired to write a considerable number of notes which were only loosely based on the text itself. Subsequently Collins devised a plan to publish Kinckhuysen’s ‘Introduction to Algebra’ with Newton’s notes and additions, but by the summer of 1671 Newton was beginning to prefer the idea of complementing the Kinckhuysen translation with a self-standing treatise on infinite series, and possibly also a discourse on equations.²⁶ Wallis was evidently inclined to agree with Newton’s idea, as he sets out in a letter to Collins (No. 9). Nothing more happened, although the book and its translation did for some time pass into Newton’s ownership. Collins meanwhile turned his attention to other publication projects, such as compiling a treatise of analytical conics. Admittedly, Kinckhuysen was to be included, but in this case with parts of another work, namely his *De Grondt de Meet-konst* (No. 24).

²⁴C. J. Scriba, ‘Mercator’s Kinckhuysen-Translation’, 50.

²⁵*Philosophical Transactions* No. 49 (19 July 1669), 998.

²⁶COLLINS–GREGORY 24.XII.1670/[3.I.1671]; *James Gregory*, ed. H. W. Turnbull, 153–9, 156–7; NEWTON–COLLINS 20/[30].VII.1671; *Correspondence of Isaac Newton*, eds. H. W. Turnbull, J. F. Scott, et al., I, 67–9, 68.

Introduction

Around the middle of January 1673/4, Wallis was asked by Oldenburg to inquire in the Bodleian Library after the Selden codex of Vettius Valens (120–c.175). This request had originated from the French scholar Pierre Daniel Huet (1630–1721), who was working on an edition of the Hellenistic astrologer's *Anthology*, and had been communicated to Oldenburg by his German compatriot Leibniz shortly after arriving on his first visit to London. Huet, whose identity was evidently at first not revealed to Wallis—he refers to him simply as ‘the gentleman in Paris’—sought to supply the deficiencies of the Hamburg codex of which he had a transcription already. Having eventually found the Oxford manuscript amongst the then still uncatalogued Selden papers, Wallis recognized that both the difficult subject matter and the unusual Greek hand in which it was written meant that there was little sense in having a copy commissioned (Nos. 70, 72). Wallis's advice that it would be better for the Hamburg copy to be sent to Oxford for collation against the Selden codex was duly conveyed in a letter from Oldenburg, which Leibniz brought back with him to Paris (No. 76). Huet in his reply to the secretary of the Royal Society accepts the wisdom of Wallis's argument, but recognizes, too, that the ongoing military conflict with the United Provinces is a barrier to scholarly endeavours: ‘as this war is raging which besets all routes by land or sea it is impossible to send my codex safely; we must await either the happy return of peace or the journey of some ambassador.’²⁷

We can assume that Oldenburg would have passed these sentiments on to Wallis along with Huet's thanks for the efforts he had made on his behalf. Wallis himself would have been aware of the destructive effects of the Third Anglo-Dutch War on intellectual commerce. Shortly before the conflict had broken out, he had drawn up new plans for achieving his aim of having his mathematical works reprinted in the Netherlands, in order that they might reach a wider readership on the continent. The philologist Thomas Marshall (1621–85), a man with excellent connections in Holland and who evidently travelled back to England regularly, was to help him in this enterprise. Publication of at least some of Wallis's work on algebra, promised to the learned world since 1657, was also under discussion. Nothing more became of these plans which even if they had been favourably received in Amsterdam or Leiden were no doubt frustrated by the war. In October 1672, Marshall became rector of Lincoln College and settled in Oxford for good.

²⁷HUET–OLDENBURG [26.III]/5.IV.1673; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, IX, 538: ‘sed cum hoc flagrante bello, quo viae omnes terra, marique sunt infestae, tuto ad vos perferri codex meus minime possit, expectandus est vel aureae pacis reditus, vel Legati alicuiusque ad vos profectio.’

Physical and mechanical themes

The distribution of Wallis's works on the continent, or lack of it, is a topic implicitly raised when Oldenburg sends Wallis the synopsis of Gaston Pardies's (1636–73) proposed treatise of motion at the beginning of 1672. In the proposal no mention whatsoever is made of Wallis's three-part *Mechanica: sive, de motu, tractatus geometricus*, which had been completed the previous year, despite the close proximity, indeed occasional identity, of their subject-matter. Evidently, it was the thematic relationship which also made Wallis the obvious choice for Oldenburg as reviewer of Pardies's proposal. Although the Savilian professor praises Pardies's efforts in promoting natural philosophy and mathematics, he makes clear his displeasure at being overlooked by comparing each of Pardies's stated aims to what he had achieved in his own work. He also draws attention to intersections with the work of Huygens and Hooke, noting that the explanation of sound and light on the basis of wave theory had already been dealt with in the *Micrographia*, published in 1665 (No. 7).

Although the *Mechanica* was now in print, Wallis continued to work on a number of related topics. In a letter to Oldenburg, subsequently printed in the *Philosophical Transactions*, he presents additional material on the centre of gravity of a hyperbola (No. 45). When considering a question concerning the stretching of a string, raised by Richard Towneley (1629–1707), Wallis recognizes its thematic proximity to the *Mechanica*, but notes that he had been concerned not to swell the book with 'too many diversions' (No. 16).

The importance of journal articles in promoting scientific debate is reflected in the problem of explaining anomalous suspension. Wallis had dealt with this topic in his *Mechanica*, but its origins went back to the early 1660s and the development of the air-pump. Huygens, having built one of Boyle's 'pneumaticall engines', but with significant changes of design, discovered that when the Torricellian experiment was carried out in an evacuated chamber with water purged of air, the column of water remained in the tube, even after the air pressure held to support it was removed. When Boyle heard about Huygens's experiment, he suspected at first that the column of water had been held up by residual air and that therefore Huygens's air-pump was defective.²⁸ This claim about the pump and the implicit denial of the fact was repeated numerous times over the course of the following weeks, while Huygens confidently asserted the fact and conversely questioned the reliability of Boyle's air-pump. Despite the force of increasing evidence, Hooke

²⁸BOYLE–MORAY III.1662; *Œuvres complètes de Christiaan Huygens*, eds. D. B. de Haan, J. Bosscha, et al., VI, 581–2.

and Boyle for some time failed to reproduce Huygens's result. Indeed, it was not until the summer of 1663 that the experiment of anomalous suspension was successfully carried out in London and subsequently repeated before members of the Royal Society.²⁹ In the following weeks more experiments were carried out in order to elucidate further the phenomenon of anomalous suspension. At Boyle's suggestion mercury was substituted for water. He also proposed conducting the experiment without using the air-pump. Although at least four days were required in order to purge the mercury in open air, the subsequent trials were successful, as both Boyle and Brouncker reported.³⁰

The debate between Boyle, Hooke, and Huygens was never purely one about experimental evidence; it was also about the theoretical grounds and hypotheses put forward to explain an increasing body of experimental facts. From the outset, the Torricellian experiment had posed fundamental questions concerning the composition of matter and the possibility of the vacuum. The phenomenon of anomalous suspension had added further questions which in many ways demanded revision or extension of existing theories, including those put forward by Thomas Hobbes (1588–1679) and Baruch Spinoza (1632–77). For Huygens, anomalous suspension provided additional evidence for the existence of a fine matter, more subtle than air, which was capable of penetrating glass, water, or mercury. In an article, originally published in the *Journal des Sçavans*, and later in English in the *Philosophical Transactions*, he recapitulated the history of the air-pump and of anomalous suspension, before proceeding to give a revised account of the phenomenon. To this end, he employs the concept of *liaison* which, while violating his own mechanical principles, served to make the action of fluids in the experiment more plausible.³¹

Huygens's article reignited the debate on anomalous suspension. As part of the response to the Dutch mathematician's latest contribution, Wallis sets out in a letter of September 1672, later published in Oldenburg's journal, the various explanatory accounts and their different definitions of air and subtle matter, and proposes a number of experimental investigations to elucidate the central issues further (No. 46). Subsequent letters sent to Oldenburg contained additional material for inclusion in the published

²⁹ *The History of the Royal Society*, ed. T. Birch, I, 295.

³⁰ BOYLE–OLDENBURG 29.X/[8.XI].1663; *The Correspondence of Henry Oldenburg*, eds. A. R. Hall and M. B. Hall, II, 123–6; *The History of the Royal Society*, ed. T. Birch, I, 301, 305, 310, 314.

³¹ 'An Extract of a Letter of M. Hugen's', *Philosophical Transactions* No. 86 (19 August 1672), 5027–30, 5028; S. Shapin and S. Schaffer, *Leviathan and the Air-Pump*, 271.

version (Nos. 50, 51, 52, 55). After hearing that his suggestions had been passed to Hooke for consideration, Wallis expressed satisfaction that the experiments proposed were at hand and regretted that he was unable to attend the Royal Society meetings himself (Nos. 52, 59). Before Wallis's article appeared, it was evidently shown to Brouncker, whose own position was compared to that of Huygens. On hearing of Brouncker's dissatisfaction over the way in which his notion of subtle matter was expressed, Wallis offered Oldenburg something for 'the more clear or advantageous expression' of that notion (Nos. 69, 72).

Mathematical practice and scientific instruments

While partaking in the debate over anomalous suspension, Wallis also concerned himself with what was becoming a more conventional application of the Torricellian tube. In a series of letters exchanged with Oldenburg, the two men recorded and compared barometric readings in London and Oxford over a number of weeks (Nos. 4, 6). Wallis and Oldenburg also conveyed to one another information on Newton's new reflecting telescope, after Oldenburg had sent news of its arrival in London. In forming his opinion, Wallis relied on an account of the telescope which Collins had given in a letter to Bernard, and which Bernard had subsequently shown to Wallis (No. 4). When Collins shortly afterwards informed Wallis of improvements to the microscope made by Newton and Hooke, Wallis expressed his satisfaction, but noted that he had no personal acquaintance with the Cambridge mathematician (No. 9).

In the spring of 1672, Bernard lent Wallis a copy of Poterius's book on weights and measures which had been sent to him by Collins. The intelligençer had plans to include Poterius in a new publication project and was evidently keen to elicit the views of Wallis and the acting Savilian professor of astronomy. Nor did Wallis disappoint, going to considerable lengths to explain what he considered to be the book's strengths and above all weaknesses (No. 23).

The long-awaited publication, in 1673, of the first part of Hevelius's *Machina coelestis*, containing a detailed description of his astronomical instruments, prompted Wallis to write a congratulatory letter to the author, in which he also thanked him for the personal copy he had received. The main focus of the letter is, however, Hevelius's employment of diagonal or transversal scales. The Royal Society's curator of experiments, Robert Hooke, had attacked the Danzig astronomer for rejecting the use of telescopic sights in positional astronomy and for using open-sighted instruments with transversal scales instead. In his assessment, Wallis was able to fall back on notes

he had written more than twenty years earlier when he was more strongly inclined towards astronomy (Nos. 141, 143, 144). However, Wallis did much more than simply express a view. By providing mathematical justification for the use of transversal scales, he soon became a key ally of the Danzig astronomer in his dispute with Hooke. In effect, Wallis not only defended the right of Hevelius to use the instruments of his choice, but he also gave his approbation to the techniques themselves, at least until such time as other techniques were shown convincingly to be superior (Nos. 166, 220, 221). Wallis's letter would go on to play an important part in subsequent development of the dispute, being quoted in publications of the two opposing sides.

Questions of natural history

An intellectual quarrel of a different kind resulted from what at first must have seemed to Wallis like a typical dialogue with a scientific amateur living in the provinces. In June 1673, the Sheffield landowner Francis Jessop (1638–91) sent reflections on Wallis's theory of tides to his friend Martin Lister (1639–1712), having heard from him that he would be glad to communicate these reflections to Henry Oldenburg in London. Needless to say, when they reached the secretary of the Royal Society, he immediately forwarded them to Wallis in Oxford. Over the course of the following months, a series of epistolary exchanges took place, always involving the intermediaries Lister and Oldenburg.

Wallis's theory of tides had originally been published in August 1666.³² In it, he developed further Galileo's explanation which had made the tides a combined effect of the diurnal rotation of the earth about its own axis and of its annual rotation about the sun. Although Wallis employed the same two motions, he argued against Galileo that it is not the centre of the earth that describes an orbit around the sun, but rather the centre of gravity of the earth and the moon. The moon itself was considered to have decisive influence in determining the periods of the tides. Jessop in his reflections considers in detail the compound of the earth's annual motion and of the moon's menstrual motion and finds that the centre of the earth in fact describes a cycloidal line. Through further consideration of the cycloid produced, Jessop elicits what he believes to be a discrepancy between Wallis's theoretical model and the observed regularities of ebb and flow (Nos. 91, 92, 97).

³²'An Essay of Dr John Wallis, exhibiting his Hypothesis about the Flux and Reflux of the Sea', *Philosophical Transactions* No. 16 (6 August 1666), 263–81.

While reading Jessop's reflections on his theory, Wallis wrote a number of short comments between the lines or in the margin. Without making a copy for himself, he returned the annotated manuscript to Oldenburg. As a result, Wallis conducted most of the subsequent exchange with Jessop on the basis of what he had remembered (Nos. 98, 103).

Believing that Wallis's comments did not do justice to the weight of his criticism, Jessop initiated a series of increasingly long and increasingly adversarial exchanges (Nos. 106, 107, 111, 115, 121). As if the topic itself did not provide enough ground for disagreement, developments in the wider Republic of Letters came into play. The discussion over the nature of the line formed by combining the annual and the menstrual motion took on a new dimension after Jessop read articles in the *Philosophical Transactions* by Wren, Brouncker, and Wallis asserting Neile's claim to priority in the discovery of the rectification of a curved line (Nos. 141, 143, 144). Jessop contended that the lines rectified by Neile, Heuraet, and others could not be constructed geometrically, and that the cycloidal line he had elicited in his reflections had not been considered by anyone else (Nos. 147, 159). In reply, Wallis affirmed Jessop's second contention, but suggested that the first could not be answered conclusively, since the concept of geometrical construction had changed considerably since Descartes's time (Nos. 153, 161, 163, 165).

Wallis's exchanges with Jessop over his theory of tides were far removed from the largely empirical debates of earlier years with men such as Joshua Childrey (1623–70) or Henry Hyrne (c.1626–after 1672). As to be expected from one who identified himself so closely with the aims and ideals of the Royal Society, Wallis remained all the time aware of the crucial importance of observation as a means to promoting natural knowledge. Thus, in correspondence with Oldenburg, he reports on an unusual frost he had witnessed in Oxford, and compares Lister's observations on plant veins with those made by Thomas Willis (1621–75) in his investigations on the structure and function of the human brain (No. 70). When an exceptionally large pike was caught in the river Thames, Wallis made a precise note of its dimensions in his notebook, remarking that he had seen an even larger one some fifteen years earlier (No. 21).

Wallis's dispute with Hobbes

A new skirmish in the ongoing war between Wallis and Hobbes came about when the aging philosopher published his latest book, in August 1672, under the title *Lux mathematica, excussa collisionibus Johannis Wallisii . . . et Thomae Hobbesii*. Written anonymously and addressed strategically to the

Royal Society, this work pretended to be an impartial review of the major points of contention between the two men which had arisen between 1655 and 1671. In all of the contentious points the author declares himself to be victorious, further reinforcing—if there was any need for this—Wallis's opinion of his adversary. Not to be outdone, Wallis wrote a scathing review, published in the issue of the *Philosophical Transactions* for October 1672 (Nos. 41, 44).

Hobbes responded immediately to Wallis's review. In a letter to Oldenburg, a copy of which Oldenburg sent to Wallis, he faulted particularly the Savilian professor's understanding of the concept of infinity, repeating thereby criticism he had made in earlier book publications. Somewhat bitterly, Hobbes suggests that the Royal Society's printer might in future publish something of his 'tending to the advancement of Physiques or Mathematiques', as the Society had on many occasions obliged Wallis in the past (Nos. 62, 63).

The appearance, in late 1673, of Hobbes's *Principia et problemata*, in which the author recapitulates earlier arguments with Wallis, was met with widespread silence. Wallis notes simply that the book required no answer, since it was 'but a repetition of what hath been oft answered allready' (No. 139).

Foreign correspondents and visitors from abroad

Among Wallis's correspondents beyond the British Isles, both old and new names are to be found. His latest exchanges with Christiaan Huygens leading to an acrimonious breakdown of their epistolary relations have already been dealt with under another heading and do not need to be repeated here. It is perhaps noteworthy that Wallis seems to have underestimated the seriousness of Huygens's silence. In a letter to Oldenburg, the Savilian professor suggests not incorrectly that the publication of the *Horologium oscillatorium* in 1673 had precipitated their falling out. When Wallis in an apparent attempt to repair the relation sent Huygens a copy of the fourth edition of his *Grammatica linguae Anglicanae*, after its publication in 1674, Huygens did not respond (No. 177).

Within the Republic of Letters it was well known that Johannes Hevelius was occupied in completing what was to be his major work, the *Machina coelestis*. Like Oldenburg, Wallis had followed progress on this work avidly since the early 1660s, and took the opportunity presented by a visitor returning to the continent through Danzig to send Hevelius a letter

of encouragement (No. 18). When the first part of the *Machina coelestis* appeared in 1673, the author sent two copies to Wallis, who duly conveyed one, as intended, to the vice-chancellor, Ralph Bathurst (1619/20–1704) (Nos. 138, 139). As already indicated, the publication provided new ammunition to Robert Hooke, who had repeatedly attacked Hevelius's use of open-sighted instruments in positional astronomy, arguing that only telescopic lenses could guarantee the necessary standards of accuracy. Wallis not only approved of Hevelius's techniques, but he also felt that Hooke's attacks were inappropriate, indeed reprehensible, being directed as they were towards a scholar of such unblemished character and good standing as the Danzig astronomer.

Like Hevelius, Ismaël Boulliau (1605–94) was also an early correspondent of Wallis. However, since the mid-1650s the two men had not been in contact with one another. They renewed their epistolary exchange in the 1670s, albeit indirectly through Oldenburg, on account of Boulliau's work on his *Opus novum ad arithmetica infinitorum*, in which he sought to elucidate further the mathematical content of the first part of Wallis's work using what he considered to be a more rigorous method. As part of this exchange, Wallis supplied Boulliau with corrections to his original publication (Nos. 224, 230).

The medical physician and mathematician Rasmus Bartholin (1625–98) used the opportunity of the return to England of the diplomat Thomas Henshaw (1618–1700) to send a letter to Wallis. Shortly afterwards, the Savilian professor received a copy of Bartholin's recently published work *De naturae mirabilibus quaestiones academicae*. Bartholin's generosity was scarcely reciprocated. Wallis uses his reply merely to express his gratitude for the gift and to praise Bartholin's contributions to the mathematical sciences. He also encourages him to proceed with his valuable work on the edition of Tycho Brahe (1546–1601), commissioned by the king of Denmark (Nos. 173, 219).

Wallis recognized the importance of correspondence generally in providing a faithful record of the development of scientific ideas. Questions concerning the origins of important mathematical discoveries could on his view be at least in part resolved by looking at evidence provided by such sources as letters written by the chief protagonists. Thus, he saw the letters of Leibniz, Newton, and others as providing a major part of the historical evidence relating to the discovery of the theory of fluxions by Newton and of the infinitesimal calculus by Leibniz. Many of the key documents in this sense, including the major part of his extensive epistolary exchange with Leibniz, was first published by Wallis in the third volume of his *Opera mathematica*.

Although some twelve letters were neither sent by Wallis nor received by him, but were exchanged between Leibniz and Oldenburg, Newton and Oldenburg, and Newton and Collins, they all passed through Wallis's hands at some stage, were edited by him, and are therefore properly part of the Savilian professor's epistolary corpus.

Leibniz, in his letter to Oldenburg of 15 July 1674 (new style) describes improvements made to his calculating machine since his presentation of an earlier model at the Royal Society during his first visit to London at the beginning of 1672/3. He also mentions his rational quadrature of a cycloidal segment and alludes to his transmutation theorem, before praising Boyle's pneumatic experiments in the light of Matthew Hale's (1609–76) attacks (No. 179). Three months later, in October 1674, Leibniz is able to indicate the enormous strides he has made in mathematics during the first two years of his stay in Paris. Alongside news of the publication of Jean Prestet's (1648–90) *Elemens des mathematiques*, he describes recent work by Jacques Ozanam (1640–1718) on Diophantine analysis and notes how Pietro Mengoli (1626–86) had declared a publicly proposed problem by Ozanam on six squares to be unsolvable. Boldly, Leibniz claims to have found an indefinite solution to the problem, before turning to questions he considers to be of greater significance, concerning the measurement of curves. Here, too, Leibniz makes a bold claim, and not without justification, that he has given a rational series for the quadrature of the circle similar to what Brouncker and Mercator had achieved for the hyperbola (No. 188). Unknown to Leibniz, Mercator had himself formulated a series for the circle, but this had not been published.³³

Both of Leibniz's letters were conveyed by hand to London, the former by the young Danish nobleman Christian Albrecht Walter (1654–87), the latter probably by the Abbé le Vasseur (*fl.* 1674–5). Although neither of these men appears to have travelled beyond London, a considerable number of other visitors did make the journey to Oxford. For example, Benjamin von Munchhausen (*fl.* 1672–84) of Danzig and Heinrich Kellerman (*fl.* 1672–3) of Moscow brought letters with them to Oxford, including one for Wallis, after first visiting Oldenburg in London. The two men were admitted to the Bodleian Library during their stay, and years later Munchhausen was elected fellow of the Royal Society (Nos. 100, 102).

Wallis's correspondence with Constantijn Huygens (1596–1687) was not visibly affected by the rupture in relations with his son. In April 1674, the poet and diplomat sent a letter to Wallis introducing the young German

³³J. E. Hofmann, *Leibniz in Paris*, 98.

scholar who brought it to Oxford, Gerhard Meier (1646–1703) of Bremen. Meier had recently been awarded a doctorate in theology at the University of Leiden and was keen to make use of the rich resources Oxford had to offer. After his return to Germany, he took up a post at the Gymnasium Illustre in the city of his birth and later became an important correspondent of Leibniz (No. 167).

Hans Bagger, a scholar from Denmark, brought with him a letter of introduction from Henry Oldenburg when he arrived in Oxford in November 1672. Bagger spent more than half a year at the University, conducting studies in oriental languages, before moving on to Cambridge for a similar period of time (Nos. 57, 59, 64, 66).

For two other Danish scholars, Peter and Martin Rosenstand (Rosenstein), who spent some eighteen months at Oxford and acquired a considerable reputation in the University for their wit and learning, their stay ended in tragedy. Martin Rosenstand, the elder of the two, evidently put an end to his own life in a lavatory or ‘house of office’ some distance from his lodgings; officially he was declared to have killed himself in his sleep or in a dream. With the help of the coroner of the University, he was buried in the churchyard of St Mary Magdalen. Wallis’s letter to Oldenburg, relating the tragedy was conveyed to London by the surviving brother (No. 166).

Oldenburg, Collins, and scientific intelligencing

Alongside providing a conduit for news of remarkable natural observations or the latest mathematical discoveries, intellectual correspondence in the second half of the seventeenth century also served to keep networks of scholars abreast of editorial projects or new books whose imminent publication had been announced. The letters exchanged between Collins, Oldenburg, and Wallis are replete with such information. Thus, Wallis breaks off from discussing progress on his edition of Horrox’s posthumous works in order to mention to Collins the edition of Augustine of Hippo commissioned by the Congregation of St Maur and Claude Perrault’s (1613–88) edition of Vitruvius’s *De architectura libri decem* (No. 16). Collins for his part informs Wallis of mathematical publications already sent over or soon to be sent over from Paris by Francis Vernon (1637–77) (No. 20). Collins also organized, with Wallis’s help, an extensive exchange of English and Italian mathematical books with Giovanni Alfonso Borelli (1608–79). Not everything could be done by barter and Collins also had to make arrangements for Borelli to receive supplementary payment (No. 32).

Introduction

Arranging for the payment of books was difficult at the best of times. Wallis in a letter to Oldenburg of 25 September 1673 (old style) sends instructions for distributing copies of the third volume of Matthew Poole's (1624?–79) *Synopsis*, and gives details of the prices to be charged to the various recipients, including Robert Boyle and Nehemiah Grew (1641–1712). We learn that the price charged for each book was to include a charge of six pence to cover the cost of prior storage in the warehouse (No. 115). On another occasion, Wallis informs Oldenburg of the terms of payment for a book sent to Richard Allestree (1621/2–81). Again, account had to be taken of the warehouse keeper's fee (No. 153).

From Wallis's correspondence with Oldenburg it emerges that he was asked to give his opinion on the proposed English translation of *La logique, ou l'art de penser*, first published anonymously by Antoine Arnauld (1612–94) and Pierre Nicole (1625–95) in 1662. As Oldenburg would have known, Wallis was well qualified to deliver a judgment on the value of such a project, as he had not only written on logical themes himself, but also occasionally gave instruction in logic to undergraduates at Oxford. Wallis no doubt wrote approvingly, for the English version of the Port-Royal logic was published under the auspices of the Royal Society in 1674 (No. 93).

Although postal services between London and Oxford were remarkably quick and reliable, there were times when a considerable number of letters sent by Wallis or Oldenburg did not reach their destination (Nos. 3, 63, 64, 65, 95, 96). Nor were things always better with the Oxford carrier, who was generally used for transportation of more weighty or valuable packages. Particularly noteworthy is the temporary fate of a draft lease which Wallis sent for perusal to his son in London. Scarcely had it been committed into the care of Bartlett's coach before it was dropped on the route out of Oxford at the approach to Shotover Hill. It was only returned to the Savilian professor after a beggar woman who found it at the roadside had sold it on for six pence (No. 158).

Church politics and theology

With the threat of imminent war, in March 1672, Charles II had grasped the opportunity to help dissenters and Catholics by means of the Second Declaration of Indulgence. However, the resulting increase in religious liberty was only of short duration. Within a year, under pressure from the House of Commons, the Declaration had been rescinded by the king and the Test Act passed.

It was against the background of the loss of even such small concessions to Roman Catholicism, that Anthony Egan (*fl.* 1673–8) arrived at Oxford in the spring of 1674. The Franciscan friar and former confessor-general of Ireland claimed that he had since become a Protestant, and sought to be incorporated into the University of Oxford with the degree of bachelor of divinity he had supposedly obtained at Kildare. Drawing attention to the barriers to incorporation at Oxford in Egan's case, specifically the chancellor's patronage of the Catholic priest Peter Walsh (*c.*1618–88), Wallis sends him to Cambridge instead with a letter of introduction to Theophilus Dillingham (1613–78) (No. 170).

It is probably no coincidence that under the more favourable conditions which obtained towards Catholics at the beginning of 1672, when England was joining forces with France against the Dutch Republic, Wallis engaged in correspondence with the theologian Pasquier Quesnel (1634–1719). The immediate cause for writing was an elaborate prospectus for the new edition of the works of Augustine of Hippo which Quesnel had included in a recent letter to Edward Bernard. Wallis points out how badly the church fathers had been dealt with editorially in the past, and refers specifically to the earlier Froben and Louvain editions of Augustine. He then proceeds to praise the efforts of the Congregation of St Maur to edit Augustine clearly and faithfully. In reply, Quesnel provides Wallis with detailed information on the background to the new edition, describing how Arnauld had come to recognize the imperfections in the Louvain edition, despite the editors' claim at the time of publication to have removed numerous mistakes in the texts handed down (Nos. 14, 26).

Major works of theological scholarship often took years to complete. Matthew Poole's *Synopsis*, a compendium of biblical commentary and exegesis, is no exception. Having been conceived as a three-volume work, and presented as such in the original prospectus, it was eventually published in five volumes and took ten years to complete. Not least with a view to keeping subscribers satisfied, despite their long wait, Bathurst wrote to Wallis, in November 1674, asking him to ensure that the volumes were correctly collated before distribution (Nos. 115, 197, 210).

Wallis, his family, and friends

Seldom do we find Wallis's scholarly work disturbed by illness or family affairs. Not only did he have a strong physical constitution, but also a strong sense of commitment to the University of Oxford and to his intellectual endeavours. In the summer of 1672 things were different and understandably

so, when Wallis, his wife, and their daughters Anne (1656–1718) and Elizabeth (1658–1703) moved from their house next door to the Lichfield family in Catte Street to Stable Hall on what later became New College Lane. Due to the upheaval of moving furniture, books, papers, and household goods, Wallis forgot to return to his son the galley proofs of Flamsteed's *Lunares numeri* which had been sent to him for perusal as one of the minor tracts to be published with the edition of Horrox's posthumous works (No. 37).

John Wallis jr (1650–1717) was at the time in legal training at Inner Temple and living in London. He was therefore ideally placed to convey when necessary books or printed sheets to or from Collins. At the same time, his studies in law meant that he was able to assist his father in arranging leasehold for family property (Nos. 156, 157, 158). He also aided his father sometimes in his deciphering activities, but his abilities in this respect were clearly limited. Wallis senior frankly admits to Collins that his son is 'not good in transcribing, especially of what he so little understands in mathematicks' (No. 10).

Destined to inherit part of a considerable estate, John Wallis jr was naturally considered to be quite an eligible bachelor. Early in 1674/5, the Church of England clergyman Thomas Salmon (1647–1706) writes to Wallis to suggest a suitable marriage for his son. Salmon had close ties to the Savilian professor and he wrote his vindication of his *Essay on the Advancement of Musick*, in reply to attacks by Matthew Locke (c.1622–77), in the form of a letter addressed to Wallis (No. 29). Both his mother, Elizabeth Salmon (fl. 1647–74), and two of his sisters ran schools for young women in London and it is possible that through this connection the potential bride had been found. When Wallis was unable to reply to Thomas Salmon for lack of a valid address, he wrote instead to Salmon's sister Martha Woodcock (1642–after 1690). After he had received no reply from her, he wrote finally to Salmon's mother, giving her an account of his son and undertaking to consult with him on the proposal (Nos. 226, 233, 235, 236, 239).

For reasons unknown, no betrothal took place. But all was not lost. John Wallis jr eventually married Elizabeth Harris (d. 1693), who inherited the wealthy estate of Soundess near Nettlebed, Oxfordshire. Alongside politics, he devoted his career to the management of the estate. A poignant relic of the history of the Harris family, found among Wallis's papers, is a letter sent by Alethea Wither (1655–1708) to Judith Harris (1658/9–74), the sister of Elizabeth, following a visit to Soundess in the autumn of 1672. Judith was to die just two years later at the age of fifteen (No. 58).

From earlier correspondence, we know that Wallis and his wife, Susanna (1622–87) occasionally took in young women or young men as guests

when family friends or University colleagues requested this. Nor would it have been expected that the Wallis household bear any financial burden through such arrangements. During the second half of 1673, Charles Morgan (*c.*1657–?), son of the politician Edmund Thomas (1633–77), lived in the Savilian professor's house before taking up residence in Lincoln College as a gentleman-commoner. In reply to a letter from Morgan's stepmother, Mary Thomas (d. 1721), Wallis provides an account of the young man's admission to Lincoln and of the tutors assigned to teach him. The list of expenses incurred by Morgan while in Wallis's care provides valuable insight into the life of an Oxford undergraduate in the second half of the seventeenth century (Nos. 132, 136, 137).

The income of the Savilian professors was raised largely through rents on the considerable properties which Henry Savile (1549–1622) bequeathed to the University of Oxford for this purpose. When Wallis discovered that he and the astronomy professor, Christopher Wren, were being wrongfully taxed in 1671, he asked Wren to procure papers in London providing the necessary evidence. Wren duly fulfilled Wallis's request, but pointed out that correcting the error would have no financial benefit for him; since his appointment as surveyor of the royal works, Wren's duties as Savilian professor had been carried out by Edward Bernard. Nonetheless, Wren does not hide his anger at the measures undertaken by the king in order to meet the demands of his profligate spending (No. 34).

The theme of wrongful taxation recurs later, when Thomas Beck (*fl.* 1674–91), a tenant of the Savilian lands in Moreton-in-Marsh, reports to Wallis that efforts had been made to impose a levy on the rental payment, potentially reducing Wallis's professorial stipend (No. 178).

As *de facto* colleagues even before Bernard was officially appointed Wren's successor in 1673, the two Savilian professors exchanged academic gifts at the festival of the New Year on 1 January 1671/2. Bernard, who had studied mathematics privately with Wallis in the 1660s, wrote an epigram for his former teacher, while Wallis sent Bernard a carefully worked out demonstration of a geometrical problem (Nos. 1, 2).

Wallis, Wase, and the University Press

On the Feast of the Annunciation or Lady Day 1672, a lease came into effect granting Oxford's privilege of printing to John Fell (1625–86), Thomas Yate (1603–81), Llewelyn Jenkins (1623–85), and Joseph Williamson (1633–1701) at a yearly rent of £200. The four lessees effectively became a private company trading with their own capital, but they were no match for

the Company of Stationers with whom there had previously been a similar agreement on the part of the University in respect of Bibles and other classes of books.³⁴ Fell and Yate intended through the new legal arrangement to subsidize a learned press,³⁵ but this aim was successfully undermined by the Stationers who by means of price-cutting were able to make the lessees's privilege of schoolbooks unprofitable. Indeed, the venture of schoolbook publishing lasted merely six months, with the Stationers eventually agreeing to buy up Fell's stock more or less at cost price.³⁶ Having thus lost their ability to maintain a learned press, Fell and partners nonetheless prepared to take on the King's Printers as patentees of the Bible and Prayer Book interests, by maintaining their right to print Bibles in the sizes that were permitted to the universities.³⁷ Cambridge likewise felt the need to act against the recent policy of the King's Printers (No. 120).

In January 1674/5, the Architypographus of the University, Christopher Wase (1627–90), joined forces with the Oxford printers Henry Hall (*c.*1605–81/2) and Leonard Lichfield (1637–86) in a concerted attempt to bid for the main lease and sub-lease and thus regain the privilege from the Stationers. Knowing Wallis's support for the University's privilege of printing, Wase kept him abreast of developments and entreated him to provide whatever help he could. However, as Wallis no doubt recognized, Wase's efforts never constituted a truly realistic proposal (Nos. 217, 218, 222).

In the early summer of 1674 several London booksellers and stationers stood accused of having sold illegally books produced in Oxford and Cambridge. As a result of this infringement of their privilege, the two universities considered undertaking a joint action against the offenders (No. 170).

Even before Fell and his partners took charge of the press, the Delegates had agreed to publish a catalogue of printed books held in the Bodleian Library. Thomas Hyde (1636–1703), Bodley's Librarian, had finished the editing by July 1672, at which time the Delegates decided that it should be seen through to publication at the expense of the University, and that the farmers or leaseholders of the University's privilege for printing should be paid for their services in producing it (No. 210). The *Catalogus impressorum librorum Bibliothecae Bodleianae in academia Oxoniensi*, at the time the

³⁴H. Carter, *A History of Oxford University Press*, I, 68.

³⁵FELL–JENKINS 25.VII/[4.VIII]. 1671; *The National Archives* SP 29/291, No. 230: 'It is evident that both in point of honour and interest, it imports the University that the gainfull priviledgd books by being printed here, should enable us for the Edition of those other Authors which will afford no pecuniary advantage.'

³⁶J. Johnson and S. Gibson, *Print and Privilege at Oxford*, 72.

³⁷FELL–WILLIAMSON 15/[25][X]. 1672; *The National Archives* SP 29/316, No. 142.

biggest catalogue yet made of printed books, was ready in December 1674 for sale the following January.³⁸ We learn of arrangements for sending a copy to Henri Justel (1620–93) in Paris, and of the presentation of a copy to the University chancellor, James Butler (1610–88), after his return from Ireland in April 1675 (Nos. 221, 248).

Legal affairs

As Keeper of the Archives, Wallis was one of the most senior officers of the University of Oxford beneath the vice-chancellor. Assiduous in the ordering and cataloging of the University's papers, he effectively had the written history of the institution on paper before him. His accumulated knowledge made Wallis the key authority in defending the University's ancient rights and privileges during the troubled years of the 1670s, his lack of legal training being more than compensated for by his archival thoroughness, his argumentative skill, and rhetorical brilliance.

In October 1673, the former principal of Jesus College, Michael Roberts (d. 1679), wrote to Wallis after being served with a subpoena to appear in the court of chancery by a former friend from whom he had demanded the return of a loan. Roberts, who was without employment, having been overlooked for a promised bishopric in the principality of Wales, sought to have his privilege asserted and for the case to be heard in the chancellor's court instead. Wallis subsequently drew up a paper rejecting the lord keeper's arguments for refusing to grant Roberts the privilege (Nos. 124, 127).

In early 1673/4, Wallis prepared Oxford's response to recent parliamentary acts which were seen to undermine the privileges of the University of Oxford, by permitting the city authorities to impose taxes on the colleges and on members of the University in order to fund the militia and highways. Since both universities were affected, Wallis argued that the response should be seen to reflect the common interests of the two institutions (Nos. 145, 146, 149, 151). There was in many ways a pattern to such collaboration, as Dillingham had already in the past sought Wallis's advice on questions of privilege. Thus, when Dillingham provides an account of a dispute between a college butler and a town sergeant in Cambridge, which had raised fundamental questions concerning that university's jurisdiction, Wallis responds with a detailed description of the highly pertinent case of William Thackwell which had first come up in 1664 (Nos. 99, 105, 125, 129). Nor was this the

³⁸H. Carter, *A History of Oxford University Press*, I, 76–7.

only occasion in which that case played an important role in the correspondence of the two men. An Act before parliament concerning habeas corpus was likewise seen to concern fundamental questions of the jurisdiction of Oxford and Cambridge. With a keen eye for judicial precedents, Wallis dispatched the breviat of Thackwell's case to Oxford's solicitor in London. In an accompanying letter, he refers to the established principle that 'those of the University should not be drawn from their studies here to attend suits at London' (No. 148).

The case of Magdalen College, which arose in 1673 after an Oxford brewer sued the College for debt, similarly raised questions as to which court's jurisdiction was addressed: the court of common pleas or the chancellor's court. In a long letter, ostensibly written by the vice-chancellor, Wallis presents the case for upholding the University's privilege, arguing that any decision to the contrary would immeasurably harm the institution (Nos. 87, 123, 131).

A particularly scandalous liaison between an Exeter College undergraduate, William Prewett (*c.*1651–?), and a young woman lay at the heart of another legal case, to which Wallis devoted a considerable amount of time in the autumn of 1674. On discovering the liaison, Prewett's college tutor, Samuel Masters (*c.*1646–93), informed the undergraduate's mother. In an act of revenge, Prewett served his tutor with a subpoena issued by the court of chancery. Once more, Oxford's ancient rights and privileges were called into question. Primarily for the University, but also on behalf of Masters, Wallis sets out reasons for allowing the privilege that the case be tried before the chancellor's court. The privilege was eventually allowed, but only after Wallis had spent many weeks in London, at considerable expense to the University, meeting with various lawyers and the lord chancellor (Nos. 191, 192, 195, 196, 197).

Around the same time, Joshua Crosse (*c.*1614–76), formerly Sedleian professor of natural philosophy and fellow of Magdalen College, was sued by one Charles Busby to deliver up a bond. Part of the difficulty of the case arose from Crosse not living in a college or hall and therefore being beyond the walls of the University. This case was particularly pertinent to Wallis, for his own circumstances were similar. With the help of archival papers and arguments supplied by Wallis, the defence successfully pleaded that Crosse was a privileged person and that his case should therefore be tried in the chancellor's court (Nos. 193, 199, 205, 206, 209, 250).

Proceedings in the cases of Samuel Masters and Joshua Crosse were observed avidly by Joseph Crowther (*c.*1610–89), principal of St Mary Hall, who was involved in a long-running dispute with the leaseholder of

Brownswood manor, Thomas Draper (*fl.* 1664–74). After being sued by Draper in the court of chancery for refusing to renew his lease, Crowther entered a plea of privilege with Wallis's support (Nos. 198, 200, 202, 204, 207, 208, 210).

Wallis afforded the University assistance of a rather different kind in the case of Robert Hancock (*fl.* 1674), who had obtained a royal mandate instructing the University of Oxford to confer on him the degree of doctor of divinity. When it became known that Hancock, a church rector in Cornwall, was a person of disrepute, the University sought the best possible way of extricating itself from the mandate's provisions (No. 215).

Both Oxford and Cambridge were directly involved in a legal dispute which had perhaps the greatest political ramifications of all, namely that concerning the licencing of taverns. This dispute arose in the spring of 1674, when the treasury sought to remedy a shortfall in royal revenues by instructing the commissioners of the Wine Licence Office in London to review the distribution of taverns in order to assess the possibility of increasing their number. By this means, the value of import duties and wine rents paid directly to the Crown would likewise increase; unlike the more humble alehouses, taverns had always been licenced centrally. Provision in Oxford came under scrutiny in late 1673 when it was discovered that the urban community was still limited to the three taverns it had originally been granted under the terms of the 1553 Act which limited the number of outlets within each city. The Wine Licence Office, in conjunction with Oxford's civic authorities, but without consulting the University, licenced another vintner by the name of William Stirke (*fl.* 1673–5) to retail wine from premises near Holywell Street (Nos. 171, 172).

The creation of a new tavern in the heart of the collegiate university was an immediate source of grievance. The vice-chancellor, Ralph Bathurst, complained that the new tavern being not far from the public schools would 'so much the more tend to the prejudice of good order and discipline among us'.³⁹

But problems of discipline and order were not the only concern. Equally, if not more serious, was the threat presented to fundamental questions of principle. As was also the case in Cambridge, the University of Oxford had traditionally enjoyed the sole right of licensing and suppressing taverns

³⁹BATHURST-BUTLER 31.III/[10.IV].1674; *The Life and Literary Remains*, ed. T. Warton, 104–5, 104.

within the city precincts. Bathurst spelt out the problem when he wrote to the duke of Ormond, ‘Our privileges are herein deeply concerned’.⁴⁰

Evidently, the University made trading conditions extremely difficult for Stirke, harassing him on his premises and imposing penalties on undergraduates found drinking there. When Stirke as a result refused to pay his annual rent to the Crown, the commissioners of the Wine Licence Office wrote to the vice-chancellor setting out their case, and calling upon him to show where they had deviated from the law (No. 168). When their letter failed to elicit a response, the Wine Licence Office brought a suit against the University in the exchequer of pleas.

At this point Wallis became involved in the affair, and drew up a brevi-ate entitled ‘The Case of the Vintners in Oxford’, containing a compendium of relevant legislation and legal precedent. Copies were sent to the chancellor and to the lord treasurer. Evidently on the basis of information he had received from Dillingham, Wallis cites the case of John Keymer’s tavern in Cambridge in the late sixteenth century. Licenced by the collector of wine rents, Walter Raleigh (1554–1618), in defiance of the wishes of the University of Cambridge, that tavern was shut down at the behest of the privy council when the proctors complained that their jurisdiction had been molested. After detailing examples of taverns which had since then been suppressed in Oxford, Wallis expresses the view that Stirke’s tavern erected by licence from the Wine Office ‘is manifestly destructive to our Rights’ (Nos. 174, 175). Through the end of 1674 into 1675, Wallis corresponded regularly with Bathurst and legal representatives, making frequent visits to London with the University’s solicitor, William Hopkins (c.1641–81). Not without reason, Bathurst talks of the new tavern occasioning the University ‘no small trouble and charges’ (Nos. 211, 213, 225, 231, 232, 234, 238, 248). In March 1674/5, Wallis wrote to Peter Mews (1619–1706), Bathurst’s predecessor and now bishop of Bath and Wells, complaining of the new tavern set up to confront the University. In reply, Mews modestly undertook to serve the University. Joseph Williamson likewise guaranteed Wallis his desire to do all he could. Their interventions seems to have had a swift and decisive effect, for the wine commissioners immediately mailed to Bathurst an extremely conciliatory, even obsequious response (Nos. 240, 241, 242, 243, 245, 246, 247, 251, 252).

⁴⁰BATHURST–BUTLER 31.III/[10.IV].1674; *The Life and Literary Remains*, ed. T. Warton, 104–5, 104.

Crisis and reform in the Royal Society

By the summer of 1674 it was apparent to all concerned that the Royal Society was in a bad state. In May none of the planned weekly meetings took place, and after the second of the June meetings had been cancelled, the president, William Brouncker, proposed that all further meetings should be adjourned until the autumn. Attendance at meetings had been dwindling for some time and the finances of the institution were in a more perilous state than usual. Something needed to be done and so even before the summer recess it was decided that council should meet occasionally during the intervening weeks in order to consider ways to make participation more attractive, namely, 'to provide good entertainment for the said meetings, by establishing lectures grounded upon, and tending to experiments'.⁴¹

At a series of council meetings during the summer and into the autumn, most of which were chaired by the vice-president, William Petty (1623–87), concrete plans were drawn up to restore the Society to its former health. It was thought that part of the reason for the decline in experimental demonstrations in recent times was that members were reluctant to present their discoveries or inventions to such a public forum. It was therefore proposed that every fellow should swear an oath not to divulge any such information relating to 'observations, experiments, or other communications' to non-members, if the communicator so desired.⁴² In the first draft of the notice summoning the return to public meetings in November, it was suggested that on the first occasion the company would be entertained 'with an experimental exercise by their president, the lord viscount Brouncker, or Dr. Wallis'. At the following meeting, the honours would fall on Boyle, and at the meeting after that on Petty, 'or in the absence of any of them, by Mr. Robert Hooke their curator by office'. In the final draft, all explicit reference to names was dropped (Nos. 189, 190).

Oldenburg, who had kept Wallis informed of developments, told him by letter in October 1674 of council's decision to resume meetings in the near future. Wallis evidently responded to the request for good experimental entertainment by agreeing to read at the resumption his recently produced discourse on gravity and gravitation. When the date for the first public meeting was delayed by a further week, Wallis adjusted the time of his next visit to London accordingly.

⁴¹ *The History of the Royal Society*, ed. T. Birch, III, 135.

⁴² *The History of the Royal Society*, ed. T. Birch, III, 138.

Introduction

On 12 November 1674 (old style), Wallis duly read his discourse to the assembled members and produced the desired effect: during the ensuing discussion, Hooke spoke of his work on elasticity and undertook to ‘perform what he had mentioned’.⁴³ In January, Wallis and Oldenburg corresponded on the publication of the discourse on gravity and gravitation, and at the meeting of council on 28 January 1674/5 (old style) it was ordered, on Oldenburg’s proposal, that the work be printed by the Royal Society’s printer.⁴⁴ Although the copy which Wallis had left in London, was not a fair copy, nor had been corrected for the press, things moved swiftly and by February Oldenburg was able to send the Savilian professor the wood cuts of the figures for his approval (Nos. 221, 223, 230, 237).

The events surrounding the presentation and publication of the *Discourse on Gravity and Gravitation* are instructive. For anyone else, the delays in the resumption of the public meetings of the Royal Society following the summer recess might well have been a source of frustration, even anger, but not for Wallis. The changed plans fitted in nicely with his need to be in London on legal affairs concerning the University of Oxford. As on so many other occasions in the past, Wallis was more than happy to squeeze in visits to the Royal Society between rather less pleasurable meetings with the lord chancellor or senior members of the treasury. And perhaps even more crucially, if the very survival of the Royal Society as a public institution was at stake, he wanted to be the first to help out. It is not coincidental that Wallis was to speak at the first meeting of the revived Society.

If Wallis cherished his visits to London, it was not because Whitehall or the various courts of law allowed him to exploit his rhetorical skills or to enjoy a sense of power by being among the powerful. Rather, it was because at such times he was able to re-immers himself in the vibrant intellectual culture of London, to attend Thursday meetings of the Royal Society, to converse with friends such as Oldenburg, Brouncker, or Collins in their favourite coffee houses or other congenial meeting places. For him, this culture was the true legacy of the philosophical clubs of the mid-1640s in London and the 1650s in Oxford which had played such an important part in shaping his career.

⁴³ *The History of the Royal Society*, ed. T. Birch, III, 143.

⁴⁴ *The History of the Royal Society*, ed. T. Birch, III, 178.

EDITORIAL PRINCIPLES AND ABBREVIATIONS

All letters in the volume are preceded by an account (*Transmission*) of the various manuscript and printed forms in which they have been handed down. In the case of those letters whose text has not survived, the reasons for assuming that they did exist at some time are given.

The *Transmission* section also puts each letter in context, records, when known, how it was conveyed to the addressee, and supplies additional information such as postmarks, details of notes appended to manuscripts, enclosures, and so on.

Manuscript and printed sources are denoted according to the following scheme:

<i>W</i>	original manuscript in Wallis's hand
<i>w</i>	copy of Wallis manuscript in scribal (or identified) hand
<i>C</i>	original manuscript in correspondent's hand
<i>c</i>	copy of correspondents manuscript in scribal (or identified) hand
<i>E</i>	contemporary edition

Where there is more than one source in a particular category, these are numbered successively W^1 , W^2 , ..., w^1 , w^2 , ..., and so on.

All letters contained in the volume are dated according to both the old style or Julian calendar employed in England until 1752 and the new style or Gregorian calendar widely used on the Continent, with the form not given in a particular letter placed in square brackets. In the period covered by the present volume the difference between the two calendars was ten days. To accommodate the English year, which began on Annunciation or Lady Day (25 March) and which permitted a date in new style such as 16 February 1663 to be expressed in a number of ways in old style—6 February 1662, 6 February 1662/3 or 6 February 1663—the most common form (6 February 1662/3) has been used when correspondents from the Continent have not supplied old-style dates themselves. (For reasons of legibility, only the

Gregorian calendar has been used in creating the Index of Letters.) Where the place at which a letter was written can only be surmised, this also is set in square brackets.

The spelling, capitalization, and punctuation of manuscript and printed sources has been retained throughout. Contractions have been silently expanded, except where they are still in common use today, and thorn has been altered to ‘th’. The use of i/j and u/v in Latin has been modernized. All symbols, the ampersand, and use of superscripts to denote pounds, shillings, and pence have likewise been kept in their original form.

All underlining in manuscripts is reproduced as italics. The reproduction of italics from printed sources has been treated diplomatically. In mathematical passages, letters used to indicate points or places in figures, and likewise all algebraic formulae, have been italicized where the author or printer has not already done this.

Editorial signs

⟨text⟩	uncertain reading
⟨— —⟩	illegible words (the number of dashes indicates the number of illegible words to a maximum of three)
...	words omitted
[<i>paper torn</i>]	Editor’s remarks (N.B. upright square brackets contained in text or in variant readings of the critical apparatus are always either employed by the author himself or represent a contemporary addition, as indicated)
	new paragraph within a variant reading
<i>add.</i>	added
<i>alt.</i>	contemporary alteration to text by someone other than the author
<i>corr.</i>	corrected
text <i>del.</i>	word or words deleted
<i>ed.</i>	editor
<i>ins.</i>	inserted
<i>suppl.</i>	supplied
<i>r</i>	recto
<i>v</i>	verso

The critical apparatus shows the development of text through its various stages. Each successive stage replaces the preceding one. Thus stage (1)

is superseded by stage (2) and this in turn by stage (3). Further subdivisions are indicated by letters: (*a*) is replaced by (*b*) and then by (*c*), (*aa*) is replaced by (*bb*), (*aaa*) by (*bbb*), and so on.

As in the case of the critical apparatus, but placed above this, marginal annotations to texts are referenced by means of line numbers. Editorial comments (footnotes) are indicated by numerical superscripts.

Astronomical and mathematical symbols

:	aggregation	$a.b :: c.d$	proportion
∞	proportion	£	pounds
s	shillings	d	pence
~	similar	△	triangle
±	minus or plus	±	plus or minus
≲	less than, equal to, or greater than	≳	greater than, equal to, or less than
Σ	summa cuborum	X	differentia cuborum
≲	equal to or less than	÷÷	continuous proportion
q	square, power of two	c	cube, power of three
a)b(c	division	□	rectangle
≳	equal to or greater than	≲	equal to or less than
>	greater than	<	less than
♊	ascending node	♋	Pisces
♊	Gemini	♄	Saturn, Saturday
♈	Aries, vernal equinox	♁	Moon, Monday
♂	Mars, Tuesday	□	square
☿	Mercury, Wednesday	☼	Sun, Sunday
♎	segment	♋	Cancer
♍	Virgo	♀	Venus, Friday
♃	Jupiter, Thursday	♉	Taurus
♌	Leo	♎	Libra
♏	Scorpio	♐	Sagittarius
♐	Capricorn	♒	Aquarius

CORRESPONDENCE

1.

EDWARD BERNARD to WALLIS
Oxford, 1[11] January 1671/2

Transmission:

*C*¹ Draft of note sent: OXFORD *Bodleian Library* MS Smith 9, pp. 27–8 (our source). On p. 28 in Bernard's hand: 'Summatur puncto in axem Parabolae aut Hyperbolae, & (1) ducta sit (2) recta quod ducta a puncto dato ad verticem suis ab axe comprehendat $\angle$ um acutum.'

*C*² Copy of note sent: OXFORD *Bodleian Library* MS Smith 14, p. 127 (p. 128 blank) (our source).

Bernard sent this epigram to Wallis as a gift to mark the festival of New Year. Wallis replied by means of a mathematical construction: WALLIS-BERNARD 1/[11].I.1671/2.

Rev. V.

D. Johanni Wallisio,

Insigni hujus seculi

Mathematico:

E. Bernardus

Multos Annos.

Vive diu floreque, O Flos & Vita Mathesis!

A febris & fatuo liber ab Hobbiada.

Exscribunt alii: Tibi constat fama repertis,

Quanta Syracosio crevit ab ingenio.

Algebrae cunei, vectes, & trochlea cedunt,

Ac fallit Numeros Machina nulla tuos.

Naturae vires calles, & pondera rerum,

Quid restet, rogitas, amplius? Haec facere.

Ars tota exhausta est, & scripto discimus uno,

Quantum vel numeri, vel valet Ingenium.

2. WALLIS to BERNARD, 1/[11] January 1671/2

Oxon.
Kal Jan.
MDCLXXII.

Conantur laudes multa vel ora tuas.

2.

WALLIS to EDWARD BERNARD
[Oxford], 1/[11] January 1671/2

Transmission:

W Note sent: OXFORD *Bodleian Library* MS Smith 6, pp. 33–36. (p. 35 blank) (our source).
On p. 36 in Wallis's hand: 'For Mr Edward Bernard, B.D. fellow of St John's Colledge, in Oxford.' On same page in unknown hand: 'J. Wallisii problema Edw. Bernado oblatum.'
w Part copy of note sent (in Bernard's hand): OXFORD *Bodleian Library* MS Smith 3, pp. 79–80. On p. 80 in Bernard's hand: figure and calculations relating to problem.

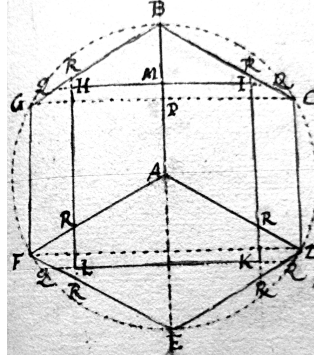
Reciprocating Bernard's gift of an epigram at the festival of New Year (BERNARD–WALLIS 1/[11].I.1671/2), Wallis sends his Savilian counterpart the construction of a mathematical problem.

5
Clarissimo Viro
D. Edvardo Bernardo, S. T. B.
Collegii D. Joannis Baptistae,
Oxonii, Socio;

10
Joannes Wallis, S. T. D.
Geometriae Professor Savilianus Oxonii,
Offert hoc
Problema.

Kl. Jan.
1672./1.

15



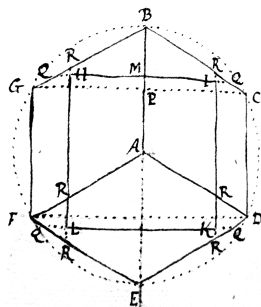
Duorum Cuborum aequalium, alterum sic Excavare,
ut per eum transeat alter Integer.

Sic Constructum.

Sit Integri (reliquum transituri) Basis, $HIKL$ quadratum, cujus Latus 5
 $HI = 1$. Huic aequalis excavatus $ABDG$, intelligatur Sphaerae inscriptus,
Diametrum habenti (Cubi Diagonio aequalem) $BE = \sqrt{3} = 1.7320508$:
Cujus Circulus Maximus (per oppositos angulos $B E$ transiens) Polos
habeat, Angulum A , et (latentem) huic oppositum: Cuboque in Cir- 10
culi planum projecto, Angulo A Centrum occupante, alii $BCDEFG$
perimetrum attingant, Lateribus interjectis Hexagonum regulare forman-
tibus, in tres Rhombos (totidem Quadrata repraesentantes) divisum:
Quorum itaque Laterum singula, ut AB , (quae in Cubo fuerant 1,) erunt
(sic projecta) $\frac{1}{2}\sqrt{3} = 0.8660254$, (semidiametro Sphaerae, Circulive in ea
maximi, aequalia;) Adeoque semisses $AP = PB = \frac{1}{4}\sqrt{3} = 0.4330127$: et 15
Diagonium Basis, DF , vel CG , (inscripti Trigoni latus,) $\frac{3}{2} = 1.5000000$:
hujusque semisses, $PG = \frac{3}{4} = 0.7500000$. Intelligatur denique eidem Cir-
culi plano recte insistens Cubus ille alter insectus; cujus Basis congruat
Quadrato $HIKL$, hujusque punctum medium Centro A : Laterique HI
(ipsi GC parallelo) insistat normalis (a Centro) $AM (= \frac{1}{2}HI) = \frac{1}{2} =$ 20
 0.5000000 : Ipsumque Latus HI occurrat (productum) perimetro Hexagoni
in QQ .

Dico; Planis ad Circuli planum rectis, perimetro Quadrati $HIKL$ insis-
tentibus, factum iri Cubi BE perforationem, per quam transeat HK Cubus
[34] integer.] 25

Quippe; cum sit, ut $BP (= \frac{1}{4}\sqrt{3},)$ ad $BM (= AB - AM = \frac{1}{2}\sqrt{3} - \frac{1}{2} =$
 $0.3660254,)$ sic $PG (= \frac{3}{4},)$ ad $MQ = \frac{3}{2} - \frac{1}{2}\sqrt{3} = 0.6339746$:



major erit MQ , quam $MH = \frac{1}{2} = 0.5000000$: Adeoque punctum H intra perimetrum Hexagoni. Similiter ostendetur, reliqua puncta IKL , esse intra eandem perimetrum. Adeoque tota perferatio, erit intra Cubi solidum. Quod erat faciendum.

5 Quo autem facilius res ad praxin reducatur; sic reperiantur puncta QRM . Nempe, ut $BP (= \frac{1}{4}\sqrt{3})$ ad $BM (= \frac{1}{2}\sqrt{3} - \frac{1}{2},)$ sic $BG (= \frac{1}{2}\sqrt{3})$ ad BQ (vel $BE) = \sqrt{3} - 1 = 0.7320508$, in projectione; hoc est, $BG (= 1)$ ad BQ (vel $BE) = 2 - \frac{2}{3}\sqrt{3} = 0.8452996$, in Cubo. Iter, ut $PG (= \frac{3}{4})$ ad $MH (= \frac{1}{2},)$ sic $BG (= \frac{1}{2}\sqrt{3})$ ad BR (vel AR , vel $ER,$) $= \frac{1}{3}\sqrt{3} = 0.57735033$, in
10 projectione; hoc est, $BG (= 1)$ ad BR (vel AR , vel $ER,$) $= \frac{2}{3} = 0.6666667$, in Cubo. Denique, ut $AB (= \frac{1}{2}\sqrt{3})$ ad $AM (= \frac{1}{2})$ in projectione; sic $AB (= 1)$ ad $AM = \frac{1}{3}\sqrt{3} = 0.5773503$, in Cubo. Junctisque in Cubi superficie lineis QMQ , QQQ , et RRR , se mutuo decussantibus in $HIKL$, (similiterque in oversa Cubi parte;) exempto quod est intra $HIKL$, habebitur perferatio
15 quaesita.

Nempe, In Cubo,

	AB	$=$	1.0000000
	EQ	$=$	BQ
		$=$	0.7320508
ER	$=$	BR	$=$
		AR	$=$
			0.6666667
		AM	$=$
			0.5773503.

3.

HENRY OLDENBURG to WALLIS

9/[19] January 1671/2

Transmission:

Manuscript missing.

4. WALLIS to OLDENBURG, 14/[24] January 1671/2

Existence and date: mentioned in OLDENBURG–WALLIS 16/[26].I.1671/2 (according to WALLIS–OLDENBURG 18/[28].I.1671/2).

As Wallis reports in WALLIS–OLDENBURG 18/[28].I.1671/2, this letter failed to reach him in Oxford.

4.

WALLIS to HENRY OLDENBURG
Oxford, 14/[24] January 1671/2

Transmission:

W Letter sent: LONDON *Royal Society* Early letters W1, No. 135, 2 pp. (our source). Damage through breaking of seal; missing text copied in by Oldenburg. At top of p. 1 in Oldenburg's hand: '(Ent(ere)d L.B. 5: 94.)' and at foot of p. 1, again in Oldenburg's hand: 'An Extract of Dr Wallis's letter to M. Oldenburg containing some Barometrical Observations of his (1) and hi(s) (2) , together with his thoughts of Mr Newtons reflecting Telescope, and Sir Sam. Morelands loudspeaking Trompet.' On p. 2 beneath address in Oldenburg's hand: 'jan. 15. 71./2. Answ. jan. 16. 71. Sent him a copy of Pardies letter about the book he is going to print'. Postmark: 'IA/15'.—printed: OLDENBURG, *Correspondence* VIII, 466–7.

*w*¹ Copy of letter sent: LONDON *Royal Society* Letter Book Original 5, pp. 94–5.

*w*² Copy of *w*¹: LONDON *Royal Society* Letter Book Copy 5, pp. 106–7.

Reply to: OLDENBURG–WALLIS 30.XII/[9.I].1671/2.

Answered by: OLDENBURG–WALLIS 16/[26].I.1671/2.

Oxford January 14. 1671.

Sir,

I have forbore to answer yours of Dec. 30. in hope to have had some farther account from Dr Morrice⁴⁵ to send you. I had first from him (concerning the Nux Vomica⁴⁶, Arbor Bdelii⁴⁷, & Mirrhæ⁴⁸,) onely this general account, that

⁴⁵Morrice: i.e. Robert Morison (1620–83), Scottish-born botanist, *ODNB*. He was royal physician and professor of botany to Charles II from 1660. Elected professor of botany in the University of Oxford, December 1669. Cf. WALLIS–OLDENBURG 18/[28].I.1671/2 (i).

⁴⁶Nux Vomica: i.e. the seed of the strychnine tree, native to India.

⁴⁷Arbor Bdelii: i.e. bdellium, an aromatic gum resin resembling myrrh.

⁴⁸Mirrhae: i.e. myrrh, a gum resin from trees of the genus *commiphora*, originating particularly from eastern Ethiopia and the Arabian peninsula.

in Piso⁴⁹, Johannes Margravius⁵⁰, & Clusius⁵¹ in his second part⁵² de Exoticis, you might have an account of them. I have since (with him) consulted Piso, but in him we found nothing. The other two hee promised mee to search & give mee an account; but hath not yet done it, though I have divers times
 5 called upon him for it. I think he will very shortly be at London, & I doubt whether I shall have any further account of him before he go; but there you may possibly have it of him, for I told him it was from you that I received the Quaere.

My Barometer, which with yours was Dec. 24 at $30\frac{1}{8}$, was fallen the
 10 next day to $29\frac{1}{2}$; & December 30, 31, below 28; but Dec. 29 & Jan. 1, about $29\frac{1}{4}$, & rose till at Jan. 5, 6, to $29\frac{3}{4}$ & Jan. 7. a little higher; then fell, & is this morning at 29 or a little lesse (these two last night having been rainy;) I expect it will now rise all this week.

Mr Newton's improvement of the Telescope, by contracting it, (which is
 15 very advantageous,) I have seen an account of, in a letter⁵³ from Mr Collins to Mr Bernard; onely (I perceive) there is a difficulty to find the object, & it is more dark by the reflexion; these may perhaps by further improvement be rectified.

9 $30\frac{1}{8}$, (1) fell by (2) was fallen
 11 fell, (1) till (2) & is
 13 rise |till Sunday or *del.*| all

⁴⁹Piso: i.e. Willem Pies (Piso) (1611–78), Dutch physician and naturalist. Accompanied Prince Johan Maurits of Nassau-Siegen (1604–79), governor of the Dutch West India Company, on his expedition to Dutch Brazil between 1637 and 1644. Co-authored with Georg Marcgraf *Historiae rerum naturalium Brasiliae*, 8 vols, Leiden and Amsterdam 1648.

⁵⁰Margravius: i.e. Georg Marcgraf (Marggraf) (1610–44), German naturalist and astronomer, resident in Leiden from 1636. Accompanied Prince Johan Maurits of Nassau-Siegen (1604–79) on his expedition to Dutch Brazil between 1637 and 1644. Co-authored with Willem Pies *Historiae rerum naturalium Brasiliae*, 8 vols, Leiden and Amsterdam 1648.

⁵¹Clusius: i.e. Charles L'Ecluse (1525–1609), Fench botanist, professor of botany at Leiden from 1593.

⁵²second part: i.e. L'ECLUSE, *Exoticorum libri decem: quibus animalium, plantarum, aromatum, aliorumque peregrinorum fructuum historiae describuntur*, 3 vols, [Leiden] 1605.

⁵³letter: this letter from Collins to Bernard has evidently not survived. Collins's letter to Francis Vernon of 26 December 1671 (old style) contains a detailed description of Newton's reflecting telescope which no doubt resembled in part what he wrote to Bernard. See HALL, *John Collins on Newton's Telescope*, 73.

Sr Samuel Morelands book⁵⁴ I have not seen, but mention was made of the thing in the same letter of Mr Collins. The problem he mentions, must be solved by experience, (rather than demonstration,) there being a complication of so many physical accidents, that the neglect of some one unheeded may soon defeat a demonstration, deduced from some others of them. 5

When you write to Mr Vernon, you may desire him to let mee know whether what⁵⁵ I have inserted from Mr Hugen (in my last chapter of my book de Motu) be to his content; I indeavoured it might be so.

My service, with a happy new year, to yourself & Lady⁵⁶, from 10

Sir,

Your affectionate friend
& servant,
John Wallis.

I did not hear, til I heard it from you, that Mr Bohun's⁵⁷ Book⁵⁸ was stopped in the presse; It was, I am told, onely for two or three words (I know not what,) but is now abroad, though yet I have it not. I presume it is at London before this time, else I would send you one. 15

[2] These

For Mr. Henry Oldenburg, in the Palmal, near St. James's, London. 20

⁵⁴book: i.e. MORLAND, *Tuba stentoro-phonica, an instrument of excellent use, as well at sea, as at land*, London 1671; 2nd edn., London 1672.

⁵⁵what: i.e. Huygens's measurement of the area between the cissoid and the asymptote, which Wallis published in the final chapter of his *Mechanica: sive, de motu, tractatus geometricus*. See HUYGENS-WALLIS late 1670-late 1671; WALLIS, *Correspondence* III, 420-6.

⁵⁶Lady: i.e. Dora Katherina Oldenburg, née Dury (Durie) (1654-77), who had married Henry Oldenburg in August 1668.

⁵⁷Bohun's: i.e. Ralph Bohun (1639-1716), Church of England clergyman and fellow of New College, Oxford. He became rector of West Kington, Wiltshire and was later prebendary of Salisbury Cathedral, *ODNB*.

⁵⁸Book: i.e. BOHUN, *A Discourse concerning the origine and properties of wind*, Oxford 1671. As emerges from WALLIS-OLDENBURG 18/[28].I.1671/2 (i), printing of the book was temporarily halted because some words were found to be too favourable to the Royal Society.

6. WALLIS to OLDENBURG, 18/[28] January 1671/2 (i)

5.

HENRY OLDENBURG to WALLIS
16/[26] January 1671/2

Transmission:

Manuscript missing.

Existence and date: mentioned in Oldenburg's endorsement on WALLIS-OLDENBURG 14/[24].I.1671/2 and in WALLIS-OLDENBURG 18/[28].I.1671/2.

Reply to: WALLIS-OLDENBURG 14/[24].I.1671/2.

Answered by: WALLIS-OLDENBURG 18/[28].I.1671/2.

With this letter Oldenburg enclosed was a copy of PARDIES-OLDENBURG [3]/13.I.1671/2 (OLDENBURG, *Correspondence* VIII, 451-6).

6.

WALLIS to HENRY OLDENBURG
Oxford, 18/[28] January 1671/2 (i)

Transmission:

W Letter sent: LONDON *Royal Society* Early letters W1, No. 137, 2 pp. (our source).—printed: OLDENBURG, *Correspondence* VIII, 482-3.

Reply to: OLDENBURG-WALLIS 16/[26].I.1671/2.

Wallis evidently posted this letter before writing his account of Pardies's plan for a treatise of motion, sent as WALLIS-OLDENBURG 18/[28].I.1671/2 (ii).

Oxford. Jan. 18. 1671./2.

Sir,

To yours⁵⁹ of Dec. 30. I answered in mine⁶⁰ of Jan. 14. But if you sent any⁶¹ of Jan. 9. (as yours⁶² of Jan. 16. intimates) it is not come to my hands. Your
5 Barometer's hight at Dec. 24. Mr Newton's Telescope, Sir Sam: Morlands
Tuba, & Mr Bohun's book, (to all which particulars my last⁶³ answered)
were mentioned in yours of Dec. 30. If since you have written any thing
before that of Jan. 16. which I have just now received, I have it not.

⁵⁹yours: i.e. OLDENBURG-WALLIS 30.XII.1671/[9.I.1672].

⁶⁰mine: i.e. WALLIS-OLDENBURG 14/[24].I.1671/2.

⁶¹any: i.e. OLDENBURG-WALLIS 9/[19].I.1671/2.

⁶²yours: i.e. OLDENBURG-WALLIS 16/[26].I.1671/2.

⁶³last: i.e. WALLIS-OLDENBURG 14/[24].I.1671/2.

The words excepted at, in Mr Bohun's book⁶⁴, were somewhat in favour of the Royall Society, & of new Philosophy, which were a little mollified, & then passed as they are now printed. What Dr Morison⁶⁵ sayd of the Authors mentioned, I suppose was at adventure; for when hee & I together did consult Piso, wee found nothing; the other Authors were not at hand: & more (I think) hee had not to say at the present. My Baroscope at Jan. 14th, was under 29 inches ($28\frac{7}{8}$) the next day at $29\frac{3}{8}$, & so ever since at $29\frac{3}{8}$ or $29\frac{1}{4}$; sunshine by day, but some rain in the nights (for the most part). 5

My 3^d part⁶⁶ de motu, I do not find that either Mr Hugen or Mr Vernon takes any notice; in your next to them you were best inquire whether they be received⁶⁷. 10

A particular account of Mr Pardies⁶⁸ paper⁶⁹, you cannot expect by this Post; (there being not time inough to write it:) But I intend it by the next⁷⁰. In the general; I do not expect much more than hath bee done allready; unlesse more application, of the general principles to particular cases, (which are infinite;) & such as (in the methods I propose) are but meerly business of calculation. 15

16 the (1) matters (2) methods

⁶⁴book: i.e. BOHUN, *A Discourse concerning the origine and properties of wind*, Oxford 1671.

⁶⁵Morison: i.e. Robert Morison. Cf. WALLIS-OLDENBURG 14/[24].I.1671/2.

⁶⁶3^d part: i.e. the third part of Wallis's *Mechanica: sive, de motu, tractatus geometricus*, published in 1671.

⁶⁷received: the delivery of the third part of Wallis's *Mechanica: sive, de motu, tractatus geometricus* was subject to delay, leading to considerable confusion in the correspondence between Oldenburg and Huygens. Oldenburg sent a copy through the hands of Henri Justel's friend Mr Rancher in October 1671. See OLDENBURG-HUYGENS 14/[24].X.1671; OLDENBURG, *Correspondence* VIII, 291. However, this had not arrived when Huygens wrote to Oldenburg on 7 November 1671 (new style): HUYGENS-OLDENBURG [28.X.]/7.XI.1671; OLDENBURG, *Correspondence* VIII, 313–15. Believing that the volume had gone missing, Oldenburg announced that he was sending another copy in OLDENBURG-HUYGENS 1/[11].I.1671/2; OLDENBURG, *Correspondence* VIII, 443–5. In OLDENBURG-HUYGENS 15/[25].I.1671/2 (OLDENBURG, *Correspondence* VIII, 468–9), Oldenburg expressed his astonishment that Huygens had not received the volume. However, Huygens was able to reply that he had in fact received his copy of part three of the *Mechanica* through Justel a few days after he had written on 7 November: see HUYGENS-OLDENBURG [3]/13.II.1671/2; OLDENBURG, *Correspondence* VIII, 468–9.

⁶⁸Pardies: i.e. Ignace-Gaston Pardies (1636–73), French Jesuit mathematician and natural philosopher, who taught at the Lycée Louis-le-Grand in Paris.

⁶⁹paper: i.e. Pardies-Oldenburg [3]/13.I.1671/2; OLDENBURG, *Correspondence* VIII, 451–6. Oldenburg sent Wallis a copy of this letter as an enclosure to OLDENBURG-WALLIS 16/[26].I.1671/2.

⁷⁰next: i.e. WALLIS-OLDENBURG 18/[28].I.1671/2 (ii).