# Learning Physics in New College in the 1690s

In a New College Note of 2021 I presented a Latin birthday poem from 1689, composed by one Bonfoy Trimnell (BA 1686, MA 1690) for a college friend of his; and this Trimnell is also he who in 1688 gave the college a copy of Isaac Newton's classic *Principia Mathematica*, published the previous year—this is the copy still in our library. Trimnell died young, in college, of spotted fever, in 1691, and in that first Note I gave a text and translation of what I then thought was his only extant poem, from 1689, 'Ad Eximium Juvenem & Rei Musicæ Callentissimum D$^{nm}$ Jacobum Worsley' ('To the excellent young man, and one most practised in music, Master James Worsley'). This poem survives now as a single sheet in the Folger Shakespeare Library in Washington, DC, evidently the very manuscript handed in college to the addressee for his birthday.

I was rash to assume that this was all that survived of Trimnell, and I was also potentially rash to assume that Trimnell's gift of Newton so soon after its publication suggests that the book 'may simply have been acquired for the purposes of donation'. For I recently re-encountered a little octavo textbook in physics published in 1690 by one of Trimnell's New College contemporaries, the *Synopsis physicæ* of Francis Willis.[1] The author was from Thame, where his father—who had also attended the college—as the rector ran the local grammar school, an institution then under the college's supervision. After a standard Winchester education, Francis Willis matriculated at New College in 1681 at the age of seventeen, and having completed his arts degrees in the usual terms pursued a medical path (BA 1685, MA 1689, BM 1691, DM 1694).[2] His textbook in physics is evidently the product of his reading and thinking for the MA, often the period in which students turned towards more in-depth study of, especially, natural philosophy. I first encountered this textbook because of the very high density in it of references to the writings of the pioneering chemist Robert Boyle (1627–1691).[3] What I had not registered was that Trimnell supplied Willis with a lengthy commendatory poem in rather Lucretian Latin hexameters for his textbook. It is the only poem prefaced to this work.

It is not Trimnell's poem, however, but the textbook it accompanies, that is the subject of this Note. It is a fascinating little work, exemplifying something historians of scholarship have come to appreciate more routinely over the last generation, namely that we should expect to find both traditional and progressive forms of what we would now term 'scientific' thought often co-existing in the same thinker or work. There was also just quite a lot of 'textbook inertia', where very traditional expositions were printed and reprinted, because they were convenient bases from which to teach. In the field of physics, we might look to the Bishop of Lincoln Robert Sanderson's (1587–1663) *Physicæ scientiæ compendium*, for instance, a rigidly Aristotelian textbook published posthumously in 1671 in Oxford by the local bookseller Richard Davis, once more with Sanderson's similarly oriented textbook in logic the next year, and again on its own by Davis in 1690. Davis clearly knew he could shift copies of this kind of thing to undergraduates and their tutors even decades after the author's death—traditional knowledge, traditionally expressed.

The New College textbook of Francis Willis, however, is an altogether more interesting object. Its full title is *Synopsis physicæ tam Aristotelicæ, quam novæ ad usum scholæ accommodata*—'A synopsis of physics, as much Aristotelian as New, accommodated for the use of the schools', 'schools' here meaning, as it still does in Oxford, for the purposes of degree tests. The book was

[1] I first mentioned Willis as a reader of Robert Boyle in 'All M$^r$ Boyl's pieces', as below; the only other modern reader known to me is Dmitri Levitin, *Ancient Wisdom in the Age of the New Science: Histories of Philosophy in England, c. 1640–1700* (Cambridge: Cambridge University Press, 2015), pp. 232n, 237n.

[2] See Anthony à Wood, *Athenæ Oxonienses*, ed. Philip Bliss (London: Lackington, 1820), IV, 558–9; Joseph Foster, *Alumni Oxonienses: The Members of the University of Oxford, 1500–1714* (Oxford: Parker, 1891–2), IV, p. 1649. His elder brother William was also at the college. For the family see the genealogy in *The William and Mary College Quarterly Historical Magazine* 5 (1896), 24–7, and the earlier pages of Byrd Charles Willis and Richard Henry Willis, *A Sketch of the Willis Family of Virginia* (Richmond, VA: Whittet & Shepperson, 1898).

[3] William Poole, '"All M$^r$ Boyl's pieces": Robert Boyle and the Bodleian Library', The Boyle Project <http://www.bbk.ac.uk/boyle/media/pdf/Boyle_and_the_Bodleian_Final.pdf>, 2018, pp. 1–25.


*New College Notes* 22 (2024), no. 4
ISSN 2517-6935

printed and partly sold in London, but it was also a co-venture with the Oxford bookseller Nicholas Cox. This man was a rather interesting character himself: he had been in the choir of New College as a boy, and in later life worked as manciple for first St John's College, and then St Edmund Hall.[4] He also ran a second-hand bookshop on the perimeter of St Edmund's Hall which was still going strong in the early eighteenth century, as we find Cox and his shop appearing with regularity in the diaries of the Oxford antiquary Thomas Hearne. He was a writer too, and his *Gentleman's Recreation* of 1673 went through at least four editions.[5] This was a conduct manual for the sporting young man, and is of passing interest here because it was dedicated to James Bertie, Earl of Abingdon, also Lord Lieutenant of Oxford; and Francis Willis himself had earlier written a Pindaric ode dedicated to that same earl.[6]

Some hint of Willis's intellectual milieu is given by his dedication of his *Synopsis physicae* to the rising Swiss mathematician and natural philosopher Nicolas Fatio de Duillier (1664–1753). Fatio had moved to England had in 1687, making an immediate mark on the intellectual scene. He soon formed his most important friendship, with Isaac Newton, and was elected a fellow of the Royal Society in 1688.[7] As Willis stated, Fatio's fame was known to anyone 'even slightly acquainted' with the letters of the clergyman Gilbert Burnet, who had described Fatio in 1687 as 'that incomparable Mathematician and Philosopher, *Nicolas Fatio Duilier*, who at Twenty two Years of Age is already one of the greatest men of his Age, and seems to be born to carry Learning some sizes beyond what it has yet attain'd'.[8] Fatio had visited Oxford in the winter of 1687, and there he evidently made the acquaintance of Edward Bernard (1638–1697), the Savilian Professor of Astronomy, as he wrote for him an account of the bronze 'sea' or giant purifying bath located in the biblical Temple of Solomon (see 1 Kings 7:23–6), published by Bernard in Oxford in 1688.[9] It was on this visit that Willis presumably got to know Fatio a little, and it gestures to Willis's intended philosophical eclecticism that he chose to dedicate a textbook that balances traditional and modern learning to a man already associated with cutting-edge theories on gravity. (Fatio had recently lectured before the Royal Society on his attempts to connect the mechanical theory of gravity of Huygens with Isaac Newton's recently-published mathematical theory of the same.) As I commenced, this connection between Willis and Fatio and Newton, indeed, makes it possible to reappraise the interests of the short-lived Bonfoy Trimnell, whose donation of Newton's *Principia* to the college may after all have had more of an intellectual point than I had first allowed.

Willis's text is structured in a manner familiar to users of Aristotelian textbooks. He starts with prefatory remarks on the senses, on terminology, and then gives a list of eleven physical axioms. He next divides his subject into general and special branches, an Aristotelian habit of the time (e.g. moral philosophy was divided into the *general* branch of ethics, with the two *special*

[4] Henry R. Plomer, *A Dictionary of the Printers and Booksellers who were at work in England, Scotland and Ireland from 1668 to 1725* (Oxford: Oxford University Press, 1922), pp. 84–5; F. G. Roberts, 'Nicholas Cox: A Literary Manciple', *St. Edmund Hall Magazine* 2 (1) (1926), 26–31. Plomer states that he had started as a bookseller in London, trading near Furnivall's Inn, Holborn, which is interesting as it is also the shop location given on the title-page of the *Synopsis Physicæ* of his co-publisher John Place, who had been trading there since the 1640s. (We indeed find several imprints for Cox at Furnivall's Inn dating from 1674 and 1675.)

[5] In this connection, back in 1680, Cox had published a bibliography of all English plays printed up to that time, really an advert for his own extensive stock, 'with divers Manuscripts on the same subject' also for sale; in 1688 he then published Gerard Langbaine the Younger's own revision of Cox's initial list.

[6] *Miscellany Poems and Translations by Oxford Hands* (London: Anthony Stephens, 1685), pp. 27–31; 'Bertie' is written, presumably reflecting contemporary pronunciation, as 'Bartue' in the poem. This earl was also the patron and protector of the great antiquary John Aubrey in this period.

[7] For him see Scott Mandelbrote, 'The Heterodox Career of Nicolas Fatio de Duillier', in *Heterodoxy in Early Modern Science and Religion*, ed. John Hedley Brooke and Ian Maclean (Oxford: Oxford University Press, 2005), pp. 263–96.

[8] *Dr. Burnet's Travels* (Amsterdam: Peter Savouret and W. Fenner, 1687), p. 11.

[9] This was published as one of two appendices to Bernard's 1688 Oxford treatise on ancient weights and measures; it was followed by Thomas Hyde's essay on Chinese weights and measures. The college's copy, now BT3.55.12, was presented by Bernard himself (see my note on this, 'Edward Bernard (1638–1697) and New College', in *New College Notes* 14 (2020), no. 3).


ISSN 2517-6935

applications of politics and economics; likewise *general* geography was the science of the globe, whereas *special* geography treated of specific regions).[10] Willis's first book, in general physics, covered abstracts such as motion, time, quality, and so forth. His second and third, the 'special' books, addressed first inanimate bodies, such as the universe itself, from the cosmos down to animals and plants; and then animate bodies, i.e. the human being and its senses and soul. But although the form is Aristotelian, the content is often modern, and Willis's attitude to Aristotle is often rather mixed.[11] Most obviously in the chapters on the heavens, Willis offers an illustration and explanation of the Ptolemaic model, but then follows this with a parallel treatment of the Copernican model. Interestingly, his Copernican account has, as Willis says, been mediated through a recent French textbook, that of the anti-scholastic Parisian physician G. B. de Saint-Romain,[12] where the 'spheres' of the Aristotelian system are redescribed in the Copernican model as 'vortices', a manoeuvre which reflects the new physics of Descartes. Indeed, there are several places throughout the textbook where the Aristotelian explanation is given, and then the Cartesian one, although Willis is not dogmatic about who is to be preferred, and Willis was no simple champion of Descartes either.[13]

What marks this as a specifically English textbook, however, are the very frequent referrals to the works of Robert Boyle in the vernacular.[14] On winds, the reader is also recommended the recent writings of Isaac Vossius, then a canon at Windsor, and Ralph Bohun, himself a fellow of New College, and to whom we shall return.[15] But the most obvious indication of the book's contemporary awareness is Willis's appendiced 'Catalogue of the most choice interpreters of nature', organised into an alphabetical list of subjects paired to recommended authors.[16] In a list of just over forty separate topics, Robert Boyle is the recommended reading for slightly over half the subjects, overwhelming any other author, with Descartes trailing behind in second place on only three citations (on elements, meteors, and sense). All other authors get just one or two citations: Newton is recommended twice (on motion, and on the tides), as are Pierre Gassendi (on atoms, and on the descent of heavy things), Marcello Malpighi (on hatching eggs, and on plants), Honoré Fabri (on the generation of animals, and on plants again), and Isaac Vossius (on tides, and on winds); with single recommendations granted to the father of English modern philosophy Francis Bacon (on winds), the Oxonian anatomist Thomas Willis (on the souls of animals), the French Cartesian Antoine Le Grand (again on animal lack of cognition), the German Jesuit Gaspar Schott (on the origin of springs), Oxford's professor of chemistry and county historian Robert Plot (the same), the Elizabethan magnetician William Gilbert of Colchester (on the magnet), the Italian Giovanni Alfonso Borelli (on percussive force), the late Henry More of Cambridge (on the

[10] Compare this with the structure of Sanderson's *Compendium*, which commences with a first book on general principles, moves in its second book to the heavens, then in its third to mixtures, meteors, and metals, and then in its final to plants, animals, man, and the soul. This is again a typical 'descent' model, from the furthest heavens down to the human at the centre.

[11] e.g. '*Visum est autem ab* Aristotele *recedere*, *quoties notions ejus veritati minus sint quadraturæ*' (sig. [A8]v); 'Juxta *Aristotelem*, qui ordine Doctrinæ potius quan essendi sequi videtur' (p. 12): Francis Willis, *Synopsis physicæ tam Aristotelicæ, quam novæ ad usum scholæ accommodata* (London: John Place, 1690).

[12] G. B. de Saint-Romain, *Physica, sive scientia naturalis, scholasticis tricis liberata* (Leiden: Pieter van der Aa, 1684), translated from his Parisian 1679 French-language *La science naturelle dégagée des chicanes de l'école*. The *Physica* was pirated in London in 1684 by the bookseller Abel Swalle, and it was probably this edition Willis used. The Leiden edition was in use in Oxford at the time too: the copy in Balliol, for instance, comes from the book-collecting bursar of that college, Nicholas Crouch (*d.* 1690). But neither the Leiden nor the London edition was the source for Willis's accompanying engravings, which must have been cut for this edition alone.

[13] e.g. *Synopsis*, pp. 62, 64. Cartesian definitions are debated on pp. 10, 11, and Descartes' letters are cited on p. 22. For an example of Willis speaking favourably of the scholastics, see p. 15: 'Hac in re cum *Alberto Magno*, *Aureoloque* [i.e. Albertus Magnus and Peter Auriol] Peripateticorum facile principibus, unum atque idem plane sentimus'. For qualifications of Descartes, see the note on Willis's use of Henry More below.

[14] e.g. *Synopsis*, pp. 39, 41–2, 56, 95.

[15] ibid., p. 64.

[16] ibid., pp. 103–8.


ISSN 2517-6935

vacuum),[17] the older Liègeois philosopher Libert Froidmont (on meteors), the rising French philosopher Nicolas Malebranche (on sense),[18] the English experimentalists and FRSs Nehemiah Grew (on plants) and John Evelyn (on earths), and the academic Ralph Bohun (again on winds). Aristotle is only recommended once (on elements). Willis, as stated, is not a modernist partizan by any means: his preface makes it clear that he will adopt Aristotelian terms and structures, just not slavishly so; and he is happy to recommend foreign and theologically awkward authors, such as Schott, Froidmont, and Malebranche: a Jesuit, a Jansenist, and an Oratorian respectively, all from within Roman Catholic fold, if occupying very different corners of it. But Willis's fondness for the *novatores*, the modern physicists, is clear, and it is textbooks such as these that show how profoundly the 'new science' was now influencing basic academic instruction, and not just advanced research.

But was Willis's *Synopsis* much used? Just over a dozen copies survive in the public domain today, including three in Oxford college libraries—not in New College itself, unfortunately. The copy in Corpus Christi College has been annotated throughout by a student of that college, Cuthbert Ellison (*d.* 1719), a man from Newcastle who had matriculated back in 1694, aged sixteen, and who took his BA in 1698 and his MA the customary four years later.[19] This would probably date his use of this book to around the turn of the century. In Eton College library, the copy there was bequeathed by Edward Waddington, Bishop of Chichester (1670?–1731). He took his degrees a little earlier than Ellison, and from King's College, Cambridge (BA 1691, MA 1695), so a good sign of student use again, closer to the point of publication, and at another university.

However, the core interest of Willis's text, regardless of its recoverable use, is as a barometer of what the intelligent tutor and student of the time thought about the branch of natural philosophy that comprised physics. And in order to stabilise this barometric reading, we might return to Bohun on the winds, being his study *A Discourse concerning the Origine and Properties of Wind, with an Historicall Account of Hurricanes, and Other Tempestuous Winds* (1671). It was locally printed, and thankfully this time the college does hold a copy. It is a fascinating work with an equally fascinating publication history, for we know from the correspondence of the Savilian Professor of Geometry, John Wallis, that the work's initial preface was censored by the university authorities in order to tone down its support for the Royal Society in London, seen by many academics at the time as a threat to their monopoly on learning.[20] Bohun, who was also employed as a tutor to the son of the diarist and virtuoso John Evelyn, was however clear that education was still best organised along Aristotelian lines. As Bohun wrote to Evelyn of Aristotle in 1668, he had 'insensibly crept into all modern writers by the use of his terms', and so 'how then can it be expected that we should understand the new philosophies without him, when the greatest part of their works consist only in confutation of his'?[21] Bohun found no contradiction in retaining the Aristotelian form of the curriculum, but teaching modern material within it.

[17] Willis's interest is explained by his earlier comment that, despite the Aristotelian abhorrence of a vacuum, he accepts with More in the *Enchiridion Metaphysicum* that one can talk of extended space as distinct from matter (pp. 34–5); and he also accepts More's affirmation of the traditional position, against Descartes, that the universe is not infinite (p. 44).

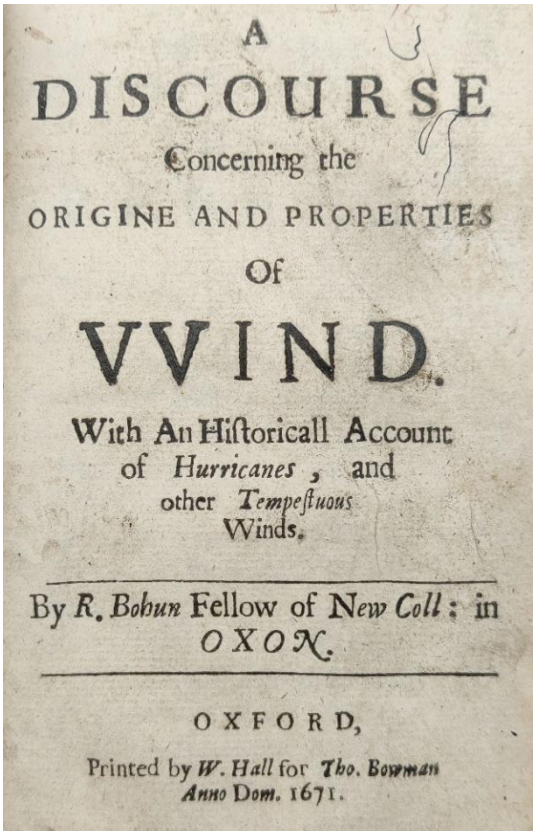
[18] Earlier (p. 98) it is clear that Willis has been reading Malebranche's *De inquirenda veritate libri sex* (Geneva, 1685), the Latin edition of his *De la recherche de la vérité* (1674–5). Abel Swalle once again (see n. 12 above) produced a London pirate of this continental Latin text, in 1687.

[19] See the relevant clause in his will: 'I do give and bequeath unto the said College Library all my books which they have not already or if any of mine is of a better Edition than theirs, this too I desire them to accept of' (London, PRO, PROB 11/571/376, fol. 256r).

[20] On this work see Michael Hunter, *Science and Society in Restoration England* (Cambridge: Cambridge University Press, 1981), pp. 145–9; William Poole, *The World Makers: Scientists of the restoration and the Search for the Origins of the Earth*, rev. ed. (Oxford: Peter Lang, 2017), pp. 9, 136–7. The college library's copy is BT3.248.11(2).

[21] Quoted by Mordechai Feingold in 'The Mathematical Sciences and New Philosophies', in *The History of the University of Oxford, Vol. IV: Seventeenth-Century Oxford*, ed. Nicholas Tyacke (Oxford: Clarendon Press, 1997), pp. 358–448, at p. 401.


ISSN 2517-6935



A
DISCOURSE
Concerning the
ORIGINE AND PROPERTIES
Of
VVIND.
With An Hiſtoricall Account
of *Hurricanes*, and
other *Tempeſtuous*
Winds.

By *R. Bohun* Fellow of *New Coll*: in
*OXON.*

OXFORD,
Printed by *W. Hall* for *Tho. Bowman*
*Anno Dom.* 1671.


Title-page and a picture of a tornado (p. 19), New College Library, Oxford, BT3.248.11(2)


Willis was evidently very similar in outlook to Bohun, who had attended the college a generation before him.[22] In some senses his textbook is necessarily a rather superficial performance, rehearsing Aristotelian definitions, but then often proposing Cartesian or other tweaks before moving briskly on. Like many other textbooks of this kind, it is really a framework for further discussion and research. But above all, it shows that that traditional methods of dividing and teaching the disciplines were alive and well in the generation of Isaac Newton, even while dons and students alike were more than aware of the huge changes going on in what we now call the sciences. We might doubt how much Francis Willis really grasped of, say, the complex mathematics of Isaac Newton; but his reading list for further research shows that he was well read in the key recent texts of modern natural philosophy. Above all, it seems that it was the many (and accessibly English-language) works of Robert Boyle that had captured the imagination of the Restoration Oxford student. Intellectual change must be measured not just by tracking pioneers, but by observing how and when such pioneers managed to change educational patterns. For that deeper project, textbooks such as that of Francis Willis of New College are the essential documents.

William Poole
Fellow Librarian
New College, Oxford

[22] He had matriculated in 1658, but despite a later clerical career he chose to take his degrees in law, a not unusual choice at New College at this time (Foster, *Alumni Oxonienses*). Bohun contributed a prefatory poem in Latin hexameters for the second edition (1670) of his employer John Evelyn's *Sylva*, his only other known publication. But he also wrote self-mocking doggerel verse for the Evelyns: see the beguiling account of Bohun and Mary Evelyn in Frances Harris, *Transformations of Love: The Friendship of John Evelyn and Margaret Godolphin* (Oxford: Oxford University Press, 2002), esp. pp. 70–74, 82.


ISSN 2517-6935