

DERBYSHIRE MISCELLANY



A View of Dopping Hill Water

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ASSISTANT EDITOR

Jane Steer
478 Duffield Road,
Allestree,
Derby,
DE22 2DJ

EDITOR

Dr Dudley Fowkes
11 Sidings Way,
Westhouses,
Alfreton,
DE55 5AS

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John Flamsteed

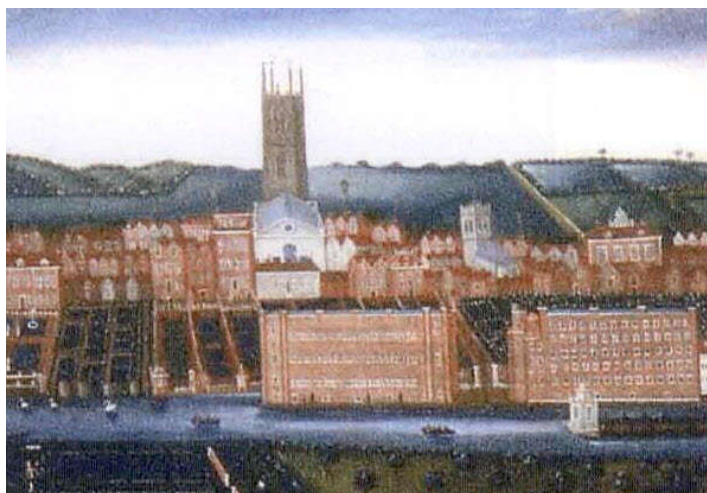
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Little Hallam Old Hall 16thC
(photograph: P.J. Steer 1998)



Little Hallam Hall 18thC
(photograph: P.J. Steer 1998)



S. & N. Buck, East View
of Derby, c1725.
Note observatory on
top of 28 Queen Street
(right hand side).

'OF KNOWN INTEGRITY, HONESTY AND FORTUNE': THE SOCIAL BACKGROUND AND EDUCATION OF THE ASTRONOMER JOHN FLAMSTEED

(by Dr Frances H. Willmoth, 4 North Terrace, Sawston, Cambridge, CB22 3EJ)

Introduction: investigating the astronomer

John Flamsteed (1646-1719) was the first in the succession of directors of the Royal Observatory at Greenwich who were later accorded the formal title of Astronomers Royal. In March 1675, when he was 28, he received a warrant of appointment from King Charles II making him '*Our Astronomical Observator*' with orders to '*forthwith apply himself with the most exact care and diligence to the rectifying the Tables of the motions of the Heavens, and the places of the fixed stars, so as to find out the so much desired Longitude of places for the perfecting the art of Navigation*'.¹ A warrant for constructing '*a small observatorie within our Parke at Greenwich*', under the auspices of the Board of Ordnance, was signed in the following June, and Flamsteed had fully moved in and begun to make systematic observations there by September 1676.² The institution went on to have a long and distinguished history as the country's national observatory, and Flamsteed remained its director for 44 years until his death in 1719, aged 73.

It seems that when Flamsteed was granted the post there was no significant competition for it; at that time there were very few who could offer a combination of practical and theoretical skills in astronomy at a sufficiently high level. This raises the question of how Flamsteed himself had become acceptably qualified: were there factors in his Derbyshire family background, upbringing and education that gave him particular advantages, and did these arise from specific social and economic conditions in that region in the middle decades of the seventeenth century?

The materials for such a study are scattered through various repositories. Firstly, Flamsteed himself left a quantity of papers, now housed as part of the Royal Greenwich Observatory collection in Cambridge University Library. Amongst these are several autobiographical pieces and some briefer personal notes. The seven longest autobiographies were published by Francis Baily in 1835, in his *Account of the Reverend John Flamsteed*; occasionally Baily quotes from some of the other notes, but only selectively, and more can be gained by going back to examine the original papers.³

A pedigree of the Flamsteed family was compiled by Nelson Bestwick and presented to Flamsteed House, Greenwich, by Ilkeston and District Local History Society in 1967. This contains a few minor inaccuracies, but has proved useful as an aid to further investigations. Local records of various kinds have provided corroboration and supplementary evidence. These include: wills held by the National Archives and Lichfield Joint Record Office; parish registers and other material held by Derbyshire Record Office (at Matlock); manorial records in private hands at Haddon Hall; and estate papers held by The National Archives and by Nottingham University Library's Department of Manuscripts and Special Collections.

In the later decades of his life, Flamsteed was especially concerned to defend his reputation and justify his conduct in his royal office; his public clashes with some of his distinguished contemporaries (particularly Sir Isaac Newton and Edmond Halley) became a subject for London gossip. A humorously-intended story noted down by Thomas Hearne in the early eighteenth century - involving Flamsteed's close acquaintance with a wheelbarrow when he worked in his father's malting business in his youth - shows how an unsympathetic observer might find grounds to mock the astronomer's comparatively humble origins. Flamsteed thus had reason to care a good deal about the social status of his ancestors. The notes that will be quoted from below suggest that he was keen to identify relatives who had claims to gentility.

In his first substantial piece of autobiographical writing, composed in 1667 (while he was still living in Derby), John Flamsteed states:

*I was born at Denby, in Derbyshire, in the year 1646, on the 19th day of August, at 7h. 16m. after noon. My father, named Stephen, was the third son of Mr. William Flamsteed, of Little Hallam; my mother, Mary, was the daughter of Mr. John Spateman of Derby, ironmonger. From these two I derived my beginning, whose parents were of known integrity, honesty and fortune as they of equal extraction and ingenuity; betwixt whom I was tenderly educated.*⁴

Much later, at the back of one of the volumes into which astronomical observations were copied in the early 1700s, he also wrote as follows:

An Account of my Ancestors

William Flamsteed came out of the North bought the land at Hallam Mere of one Robert Everet it being then rated 40sh per year rent died in the year - 1514

After his death his wife and one of his sons went into Northamptonshire. From this sonne came a family which continued long there: One of his descendents bore the Armes pasted on the following page [blank - not there!]. See the Armes of the family at Hallam in an old book of heraldry. the family in Northamptonshire is extinct not many yeares agoe. One ... [sic] Fowler a bookseller in Northampton told me his grandmothers mayden name was Flamsteed. she being one of the coheyres of it.

Steeven the sonne of William died November the 9 - 1518

Robert his sonne having overlived his eldest sonne 20 years died - - - 1590

John the 2d sonne of Robert enjoyed the estate and died December the 22 - 1634

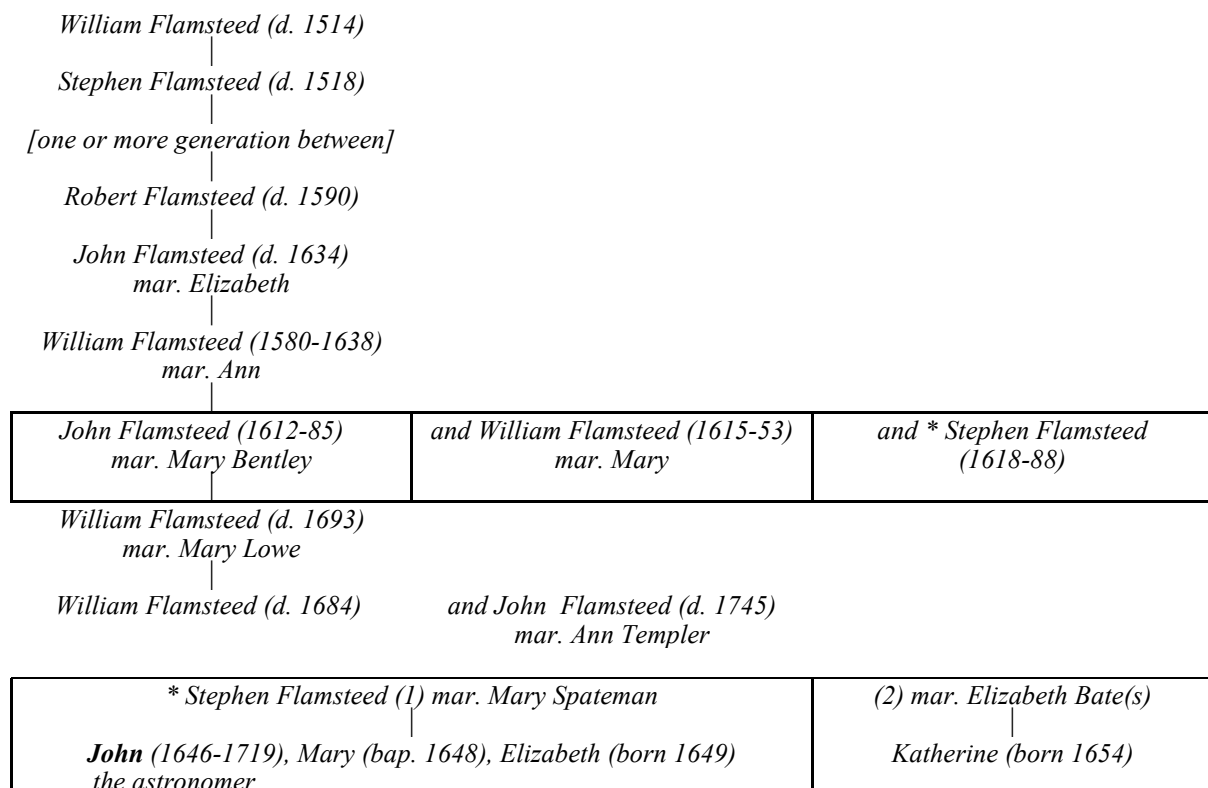
William his sonne borne October the 25 1580 died in February - 1637

he had 3 sonnes.

John the eldest improved the estate much borne 1612 and died - 1684 or 5

William the 2d eminent Steward and Towne clarke of Nottingham lies buried in St Maries neare a fayre stone with an Inscription on a pillar.⁵

Flamsteed outline family tree associated with descent of property



The Flamsteed ancestors and their landholdings

It is hard to check the earliest details of this family tree, as in the early sixteenth century church registers were not systematically kept. Some Ilkeston manorial records survive (now housed at Haddon Hall), and from these it has proved possible to confirm that a William Flamsteed was resident in the locality in the 1490s, and to establish that a William and a Robert - presumably sons of the first William - were there in the time of Henry VIII.⁶ In 1577 (*the nineteenth year of the Queen*) one Robert was succeeded by another, his son, as tenant of a piece of land called Trowell Bridge Meadow.

This last Robert was presumably the Robert Flamsteed of Little Hallam who died in 1590, and from here onward the family tree is known with more certainty. Robert's son, John of Little Hallam (d 1634), was the father of William of Little Hallam (1580-1638), who was the father of three sons including Stephen, the father of the astronomer. Stephen's elder brothers (as John their nephew noted) were John, who inherited the Little Hallam estate from their father and died in 1685, and William, who became Town Clerk of Nottingham and died relatively young, in 1653. Another William was the son and heir of this last John (d 1685); he died only a few years after his father, in 1693, passing on the estate to his son, who was yet another John. The final Flamsteed in this chain of succession was another William (baptised 1703), who died in the mid 1770s. Under his will, proved in November 1776, the principal beneficiaries were his nephews - his sister's sons - John and Richard Dodsley, who consequently added Flamsteed to the end of their name.

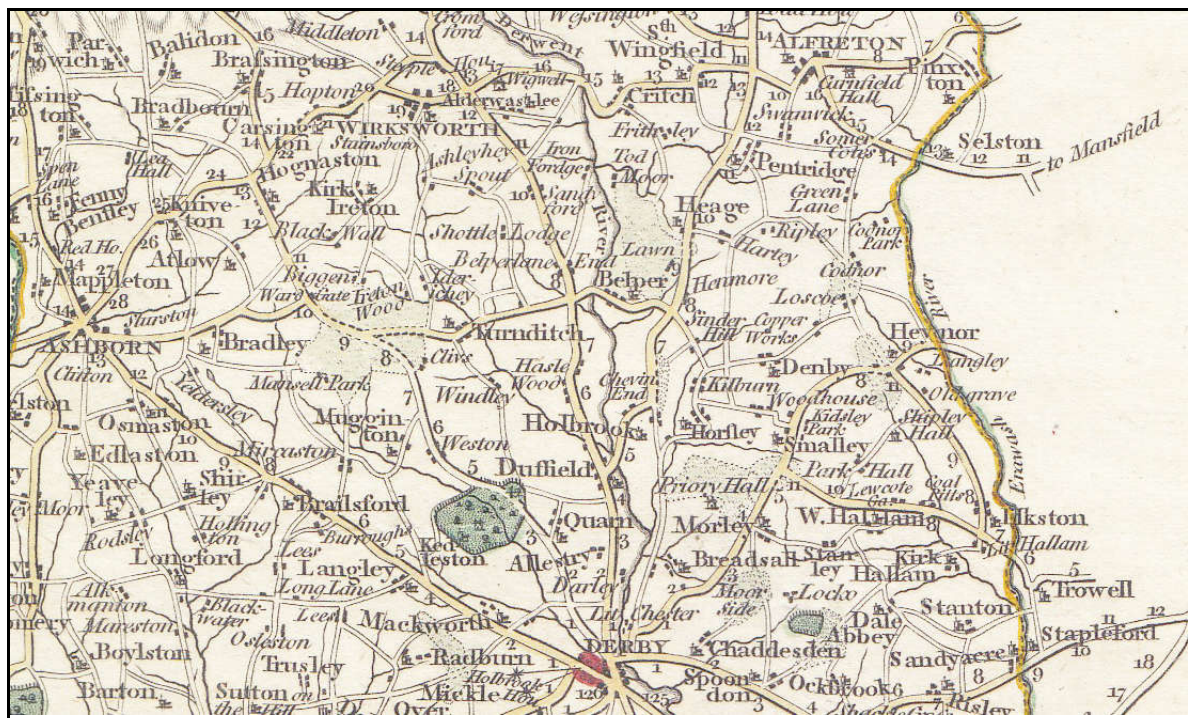
We cannot be exactly sure of the precise extent of the land bought by the first William Flamsteed in this succession in the early sixteenth century, and described above as lying at '*Hallam Mere*' but it seems likely that it remained at the core of the family property through the generations. A map of Ilkeston manor made in 1598 survives - '*Manerium de Elkeston per Mr Henry Fletcher*' - and includes the outlying hamlet of Little Hallam.⁷ A representation of it at a reduced scale was published in 1975 in an occasional paper from Ilkeston and District Local History Society; but the abbreviated coding used by the editor, Peter Stephenson, to indicate the ownership of individual plots is rather illegible in the reproduction and difficult to interpret.⁸ The cartographer distinguished between demesne, freehold, copyhold and common land, and the contemporary Flamsteeds - John Flamsteed and John Flamsteed junior - are listed only as copyholders, each with a plot in Little Hallam.⁹

The next useful source of information is a series of rentals for the middle years of the seventeenth century, preserved amongst the manorial records at Haddon Hall. From 1648 onwards the John Flamsteed of that time (the astronomer's uncle) appears in several sections of the annual list: among chief tenants '*for part of William Roes Land*'; under Ilkeston copyholders, '*for a mead*' (identified elsewhere as '*a dole in bridge mead*') and '*for part of Fullwoods Land*'; under Little Hallam copyholders, '*for his howse and two oxgangs*' and '*for one oxgang late Robert Days*'; under '*Demensnes in Lease*' for '*Harehill*' and '*two doles in Oxe mead*'; and under '*Maddocks Farme demesnes out of Lease*' for a plot called '*Calfe Close*'.¹⁰ For the last of these he paid the exceptionally high annual rent of £1 16s 8d, while the other rents ranged from threepence for the meadowland to 7s 7d for the house and two oxgangs. The evidence for his engagement in coal-mining will be discussed below, and it seems very likely that Calf Close was the site of a mine. The citing of names of previous owners makes it clear how John added to his original holding, taking on extra land whenever it became available. It looks as though the original holding consisted of one or two oxgangs, a house and (probably) access to a plot of meadowland.

A guide of much later date survives: a map drawn up for John Dodsley Flamsteed, when he took on the estate, entitled '*An accurate Survey of Land in Little Hallam Liberty, in the Parish of Ilkeston, in the County of Derby, part of the Estate Belonging to Jno. Flamsteed Esqr. taken in 1776. By William Attenburrow*'.¹¹ Not every plot shown here actually belonged to the Flamsteeds, as the process of enclosure in the parish had happened in a piecemeal manner with various owners' property and remnants of open fields intermingled;¹² but the map's existence indicates that they then owned a significant part of this land. It lay on the western edge of the parish of Ilkeston, separated from neighbouring Kirk Hallam by the Nut Brook (or Nutbrook), which is a tributary of the River Erewash. On current maps, several separate pools of a moderate size accompany the Brook in this portion of its course, so it was presumably one of those that was earlier known as Hallam Mere. The layout of the estate runs from the north-west to the south-east, being bounded on the west by the Brook, on the north-east by the road from Ilkeston to Bramcote and Nottingham and on the south-east by a length of the River Erewash. Stevenson's notes record that at the time of the Parliamentary Enclosure in 1798 the Flamsteeds held approximately 369 acres, one hundred of those being copyhold. This made them by far the largest landowners in the parish after the local aristocrat, the Duke of Rutland.

The dwelling-house associated with the estate, marked as '*Hall*' on the 1776 map, stands near one of the roads connecting the centre of Ilkeston centre to Kirk Hallam. Little Hallam Hall and Old Hall are still to be found on

this site, and the latter is sometimes credited with being the oldest domestic building to survive in Ilkeston. It is believed to have been constructed in the sixteenth or early seventeenth century, with the newer hall, built in brick and closer to the road, added in the eighteenth.¹³ Not far away is another brick building, possibly newer again, now designated 'Flamstead House'.¹⁴



Cary's Atlas 1787: Derbyshire. Little Hallam is just south of Ilkeston (Ilkston) on the east side of the map.

The family's social and economic advancement

The Flamsteeds' rise in prosperity and social status - from the yeomanry to the ranks of the lower gentry - in the course of the seventeenth century can readily be demonstrated by comparing what is known of them at the start of it with the situation enjoyed by the William Flamstead of Little Hallam who died in 1693. There seems to be no surviving probate documentation for Robert Flamstead who died in 1590, but he must have had the status of a yeoman, as this was how several of his close relatives were described: that is, his (probable¹⁵) nephew John in a will proved in 1601, and the John and the William who both died in the 1630s.

The 1601 document does not tell us much about the testator's life, except that his wife Catherine was left to bring up four young children. When the eldest, George, eventually reached the age of twenty-one, the widow was to receive a third of her husband's property or an annuity of four marks (£2 13s 4d), plus goods and chattels worth 20 nobles (£6 13s 4d). The other two thirds of the goods and chattels were to be shared by the children, with George also entitled to take 'the new standing bed in the parlor'. The relatively small sums named here indicate that John was not a wealthy man, but he was evidently a conscientious one, who when 'sick in body' wished to ensure that arrangements for the future care of his family were in good order. He appears in parish records as a churchwarden of St Mary's, Ilkeston in 1600 and in manorial court documents of the same year as an assessor of fines (one of two 'afferatores curiae'), indicating that he had a respectable standing in the local community.¹⁶ George survived to inherit, being permitted by the manorial court to take on his father's copyhold land despite being under age; he married, had a few children, took his turn at being a churchwarden, and died in 1657.¹⁷

The later John's will, drawn up in 1619 and proved on 8 May 1635, is accompanied by an inventory made on 10 January 1634/5, and both documents suggest that the testator was more prosperous than his immediate ancestors. The will mentions a freehold house let out to a tenant, as well as the main family house, and 'other freehold leases or houses within the lordship of Ilkestone'. After his widow's death, the main house was to descend to grandson John, the eldest son of William, along with 'lands, pastures, [and] meadows', both freehold and copyhold. The house had recently been improved, with 'waynescott or seeling worke' in the new chamber, which was to be left in place. William himself was to receive a cow and a calf, or £3 6s 8d 'as his child's portion', while

his sister Ann and her husband received £20. William also gained a lease of land in Cossall, though the testator's widow was to occupy this for '*a reasonable and convenient time ... till she can make her cattle fit for market*'; after the widow's death, William would inherit one third of the goods and chattels and '*all husbandry stuff*', with another third divided between the grandchildren and the final third being at the widow's own disposal.

After John's clothing and purse, the inventory of his goods lists: '*28 beastes of all sortes*', together worth £50; two swine worth 10s; ploughs, wains and harrowes worth £10; the same again for '*hay & Corne on the grounde and in the barne*'; and another 40s. for a lease of '*the great over harehill*'.¹⁸ Household furniture and '*wooden ware*' were valued at £10, with the same again for mattresses and bedding, £5 for brass and pewter, another £5 for linens, and £5 for miscellaneous items not appraised separately. The total came to £112.10s. The inventory of his son William's goods, prepared only a few years later, is very similar but totals £170, with administration granted to Ann Flamsteed of Hallam (William's widow) and William Daie (Day) of Ilkeston, yeoman (her brother-in-law). The striking increase in value derived from both livestock and corn, which strongly suggests that William was well established as a farmer in his own right before his elderly father's death, added to his means. A reference in the Middleton papers to William Flamsteed of Little Hallam, yeoman, as connected with Trowell (a parish just across the river from Ilkeston and close to Cossall) in 1617 suggests that he held land there.¹⁹

If there were surviving probate documents for the Robert Flamsteed who died in 1590, they would surely read very much as these later ones do, with similar agricultural details though perhaps without the house improvements. We know his wife was Ann, the daughter of Nicholas Day, of Ilkeston, baker and brewer. Nicholas Day's nuncupative will survives from the year 1611; it mentions one son and three sons-in-law, amongst them Robert Flamsteed.²⁰ Nicholas's name is included amongst those of copyholders on the 1598 map of Ilkeston manor. The Day family had been following their trade in the district for some decades, as in 1559 a Robert Day is mentioned in manorial records as one of four bakers and brewers each being fined twelve pence (presumably for infringing the assize of bread and beer).²¹ The family seems to have continued to prosper in Ilkeston and continued to provide spouses for the Flamsteeds: as already noted, one of Robert's grand-daughters married a Day and so did one of the descendants of Robert's nephew John.

A hundred or so years later, in sharp contrast to all of these, Robert's descendant William Flamsteed was recognised as a gentleman and was married to a wife whose relatives were undoubtedly of gentry status. The Ilkeston parish register plainly declares '*1693 - 3 Nov - William Flamsteed a Gentleman buried*', and he is described as '*gent.*' in his will (1694).²² All his descendants also claimed gentility. William's wife was Mary Lowe, who came from a prominent local family residing at Denby (of Old Hall and Park Hall, and later seated at Locko); they were lords of a manor at Denby.²³ Her father was Vincent Lowe and mother Anne Cavendish, one of the numerous illegitimate children of Henry Cavendish of Tutbury, Staffordshire.²⁴ It's clear that the Lowe family would have been thought of by their neighbours as well-established gentry, and that their horizons were wider than those of the parish or county: two of Mary's brothers, Vincent and Henry, emigrated to America in the 1670s and Vincent became a member of the legislature of Maryland.²⁵

William's will (made 5 November 1693, proved 14 February 1694)²⁶ mentions a farm bought by his father and indicates that he too had continued the process of adding land to the estate. It also says '*my executors [wife Mary and son John] ... shall have my pitts at Newthorpe and Cossall in the County of Nottingham and Ilkeston aforesaid to be managed by them out of my personall Estate ... And my mind is that if my Cole Delphes goe on well and shall turne to agood Account then my said Executors shall pay out one hundred pounds a peice to my three daughters*' (if the supervisors of the will approve), in addition to the sums already specified. The daughters are otherwise bequeathed £400, £300 and £300 respectively, payable on their marriages or on their reaching the age of 21. William was clearly a man of substantial means, attained through the combined profitability of land and coal.

The astronomer's father and uncles

Stephen Flamsteed, the father of the astronomer, was part of the generation who experienced and contributed most to this social advancement. His elder brother John (d 1685) '*improved the estate much*', partly by expanding his landholdings as has already been described above, and left a will that shows he invested in coal-mining.²⁷ This was a growing industry in the southern and eastern parts of Derbyshire, where iron ore was also found, while lead-mining was concentrated in the limestone uplands of the north and west. Under the will, John's main heir, his son William, was to receive '*my fifth part and interest in the Coleworks ... in Ilkeston*', with the income to go towards providing portions for the testator's grand-daughters. William was also to take '*all my bookes*' to be preserved for descendants, and was a residuary legatee along with his mother.

It seems reasonable to assume that for some decades before this it was the profits from coal-mining that had enabled John to improve his estate by buying additional land, and that both together had enhanced his prosperity and social status. As early as the 1630s and 1640s he is listed in manorial documents as '*Mr John Flamsteed*', whilst almost all other local inhabitants (including his cousin George Flamsteed) appear without titles. A few years after his marriage, in 1641, John's name was listed amongst those of 76 Derbyshire worthies signing a petition urging Charles I to find some means of reconciliation with Parliament; the signatories' places of residence are not stated, so one cannot be absolutely sure, but it seems very likely that this was John of Little Hallam.²⁸

The second brother of the three, William, also came to be formally described as '*Gent*'. He attained this status by moving to Nottingham and becoming sufficiently well established there to be appointed Town Clerk, serving in that office from 1644 until his death. The text upon his monument, which his nephew noted as '*in St Maries neare a fayre stone with an inscription on a pillar*', records his life in these words:

Near this place lyeth the body of William Flamstead, Gent. late Steward and Town Clark of Nottingham, who for his exemplary piety, eminent parts and singular fidelity lived much desired, and died no lesse lamented the 38. year of his age, August 24. 1653. 'The Memory of the Just is blessed'.²⁹

The politics of the district were complex and unstable at this period. This is reflected in Lucy Hutchinson's biography of her husband John, who was the parliamentary Governor of the castle and (disputedly) town of Nottingham, a county MP from 1646, a regicide and a member of the Commonwealth's Council of State (1649-51).³⁰ Her account indicates that there were numerous royalist sympathisers amongst the local population and on the parliamentary side both Presbyterian and Independent factions vying for influence in matters of religion. (The Hutchinsons themselves objected both to the political ambitions of Presbyterianism and later to the rule of Oliver Cromwell as Protector, on the grounds that he did not respect the pre-existing role and rights of parliament.)

The history of a succession of Puritan-style nonconformist preachers in Nottingham from the late sixteenth century onwards has been traced in the first piece in a collected volume on *The Beginnings of Nonconformity*.³¹ An especially long tradition of this kind has been identified at St Mary's, which was served by ministers with Presbyterian sympathies throughout the 1640s. In 1651 William Flamsteed was one of eight of its parishioners chosen as '*Ruling Elders*', under the leadership of Francis Pierrepont, a colonel in the Parliamentary army and MP for Nottingham; they went on to attend meetings of the county's Presbyterian classes.³² This, then, is what '*exemplary piety*' and '*singular fidelity*' meant to those who drafted the inscription for William's monument. He was also appointed Town Clerk in place of someone suspected of assisting the royalists at Newark.³³

Soon after his election in 1644, William was one of seven members of the town council who expressed doubts about signing documents prepared by the parliamentary County Committee as part of a dispute carried on against John Hutchinson, though these were eventually accepted as in accord with the council's policy.³⁴ In September 1645 he was appointed Clerk of the Statutes or '*Keeper of the greater part of the seal for Statutes Merchant*', a post with an important function in the town's mercantile activities through the overseeing of commercial agreements involving debts.³⁵ For a brief period in 1647 he also served as Quartermaster, and was paid a sum of £5 3s 4d for taking care of the needs of more than 3000 parliamentary troops, but after a couple of months he was spared the task, '*at his earnest request*', and two substitutes were appointed to share it between them.³⁶ His continuance in the offices of Town Clerk and Clerk of the Statutes was emphasised by specific resolutions passed in 1647 and 1652.³⁷ Thus he retained both posts until his untimely death, which took place just before Cromwell assumed the title of Protector.

William's early and sudden departure must have shocked his family and colleagues. He left the briefest of testaments:

Be it remembered - on Sun. 21 Aug. 1653, William Flamsted of the town and Co. of Nottingham, gent., being sick & not able to write his will, called neighbours to witness that he had settled his house already, and for the rest made his wife Mary executrix. Proved 14 Feb. 1653.³⁸

He also left a son, John, born by 1651, who married one Sarah Strey (a widow) in 1672. But, like his father, this John was to die at a relatively young age (before 1686).³⁹

Stephen Flamsteed's livelihood

Stephen, the third of the brothers, was about twenty years old when his father died (intestate). He had inherited a one-ninth share of his grandfather's residual estate a few years earlier; perhaps he was also helped to set up in business by his eldest brother, who inherited the Little Hallam house and lands and became very prosperous. Indeed, as a maltster and brewer, Stephen may well have been processing grain grown on John Flamsteed's estate. The activities Stephen undertook in his later career included not only malting and brewing but both managing and investing in lead-mines; in his will (made 15 December 1663, proved 2 May 1688) he is described as *'ironmonger'*, which at this date simply meant a seller of iron.⁴⁰

One can only guess as to the order of events here: it seems probable that he set up first as a maltster and brewer and then used profits from the trade to engage in the mining and metal-trading industries; but it is also possible that he was involved in both activities from an early stage. Lead-mining, in particular, was a thriving and expanding business in the 1640s, as the Civil War stimulated demand for lead (principally for lead shot), so new investors must have been easily drawn into the business in that period. After the war, the industry continued to flourish as the metal that had been torn from roofs to melt down for ammunition then had to be replaced.

Malting and brewing was an occupation requiring a significant financial investment. Both needed buildings to house them, with drying-space and a kiln for making malt, large vats and related equipment for brewing, and employees to help with the manual work. Derbyshire was already known as a centre for this industry, because of the superior qualities of the local water-supply, and its products were in demand outside the county. Thus sending a supply of local ale from his father's brewery down to London was one of the means by which John Flamsteed, as an aspiring astronomer, expressed appreciation for the friendship of his patron Sir Jonas Moore: *'The Darby ale is exceeding good'*, wrote Moore cheerfully, *'and I fancy I shall have a great deal of it hereafter by your good means, when cool wether comes'*.⁴¹ In the following October he commented that *'I find mr Menuells have Ale sent them and I have formerly tast[ed] of it, but I have thought that your father sent to be better, I hint this because of the rates of Carriadg, what your father shall doe or pay shalbe faythfully repayd, I thinck my sonn Pottenger must send down Grocery ware and Exchang for Very Good Ale'*.⁴² Before this letter arrived at its destination Flamsteed sent a further consignment, *'which a jorney yesterday morneing ... permitted mee not to see dispatchd my selfe but a servant saw both firkins carefully packt up'*.⁴³

At the same time he sent another firkin of ale to Robert Hooke, *'of which my father will not let mee set as I intended a rate, but when I speake with him wee shall agree very easily'*.⁴⁴ Moore responded again a few days later, saying he would gladly pay whatever it cost for the carriage and *'I must desire yow for as much more twice yet within a Month of thereabouts because I have presents to make to severall persons, and whatever it cost get the very best, because the Carriadg is all one. I must confesse this is to[o] mean an Employment but I desire your pardon'*.⁴⁵ Richard Towneley, on a visit to London from Lancashire, joined Moore in sampling the first batch of ale; he then contemplated setting up a brewery at home, as a result of which John Flamsteed wrote for him a *'History of Malting'* describing the necessary equipment and techniques in some detail.⁴⁶

Direct evidence for Stephen Flamsteed's involvement in the lead-mining industry survives from the later decades of his life. A volume that the astronomer eventually used for copying letters began its life as an account-book for the Vermuyden family's enterprise at the Dovegang mine, where Stephen Flamsteed oversaw day-to-day expenditure on the owner's behalf.⁴⁷ The resulting financial records run from March 1674 to January 1688, ending shortly before the compiler's death.

Dovegang lay in the Wirksworth liberty, and ran from near the Black Rocks, Cromford, to Middleton-by-Wirksworth. In the earlier part of the century most mining in that area had been carried on in a traditional fashion, by pairs of miners or small partnerships of a few people who owned shares in the mines they worked; but then, as the industry expanded through the middle decades of the century, some of these small-scale operations were superseded by much larger ones. These required more substantial capital investment, especially where there were ambitious plans for constructing drainage adits to remove water (locally known as *'soughs'*, so constructing them was termed *'soughing'*).⁴⁸

An ambitious investor from outside the county, Sir Robert Heath, attempted to gain control of a number of mines (*'300 groves or meers'*) and in 1631 took Sir Cornelius Vermuyden into partnership in order to benefit from Vermuyden's skills as a drainage engineer.⁴⁹ Protracted legal wranglings came to an end in 1638 with Heath and Vermuyden confirmed in possession of the Dovegang mine with a 31-year lease from the Crown. Vermuyden also made separate investments on his own account, and in 1637 was granted the *'lot and cope'* revenues and

office of barmaster (supervisory official) for the Wirksworth mines. He immediately delegated these duties to his agent in the locality, fellow Dutchman John Conrad Molanus (c1599-1661).⁵⁰ By this time work had begun on a major sough to drain the Dovegang mine (the Longhead Sough), although it was not completed for many years.

Sir Cornelius's business affairs were always enormously complex, as he was engaged in land-drainage projects in Hatfield Chase (in the 1620s) and later in the Fens, and in connection with these enterprises had a habit of borrowing large sums of money which he could scarcely ever repay at the time expected. He seems not to have spent much time in Derbyshire, but to have left Molanus to look after his mining concerns. (Molanus turns up in local records as a military officer fighting on the parliamentary side in the Civil War, serving under Sir John Gell; he was quartermaster for a time, and ended the war with the rank of Major.) Later, Sir Cornelius' sons Cornelius and John seem to have become his main representatives dealing with Derbyshire matters, and it is the younger Cornelius' signature that appears with Stephen Flamsteed's in the account book.

John Flamsteed's correspondence also preserves evidence of his father's business activities in the 1670s, and of the Derbyshire matters that John had to deal with after his father's death. For instance, in 1672 John wrote to one of his London correspondents, the mathematician John Collins, reporting that *'My father has taken a lease of some lead mines in Staffordshire of the Duke of Albamarle his bayliffe.'* (These mines were probably at Ecton Hill, on the western edge of the Derbyshire lead-mining district.⁵¹) He asked Collins to deal with the related legal business, sending him the sealed counterpart of the lease and some money for fees and instructing him to confer with Edmund Leneve of Clifford's Inn, the Duke's solicitor. Leneve had sent a bond of £200 *'for performance of Covenants'*, but Steven Flamsteed had decided not to sign it, because *'the minors to whom wee allow shares and employ in the worke are the basest sort of people and may, doe what wee can, commit some small faultes for which it is not just that my Lord should exact both the forfeiture of the lease and 200li bond of my father onely and his heyres.'*⁵² A further letter notes that Collins had by then carried out his commission and sent the completed lease.⁵³

Stephen himself seems very likely to have been the author of a note written in November 1683 describing the effects of a local earthquake on the preceding 6th of October. Earthquakes were of perennial interest to the Royal Society, in whose Library the note has been preserved, and they were to become a particular concern of John Flamsteed's in the early 1690s. The note records that this one occurred *'at or neer 11 of the Clock at night, which time there were no Miners at work, only at Porto Yate (about 4 miles above Wirksworth North and by West) there were some Pumpers at work 36 fathom or 72 yards deep within ground ... and there by their Account they first heard the great Noise, like the Noise of a great (Soughing) Wind, and presently all about them both Rocks and Engines, and what things else they had there, appeared to shake, but it was presently gone, and nothing moved forth of its place, there were great Hollows below them, and the workmen much terrified at it, but being so soon gone, fell to worke again, after a little pause and Consideration.'*⁵⁴

During the final year of his life, Stephen made at least two trips to London for business-related reasons. In the summer of 1687 he and two kinsfolk were there for six weeks.⁵⁵ His son later mentioned there had been another visit, early in 1688, when *'My father was with me in towne and often requireing my assistance in some of his affaires hindered me a whole moneth. he returned home the latter end of February'*. Sadly, fifteen days after his departure *'I receaved the News of his decease: he was troubled with a shortnesse of breath whilst here and had no sicknesse or other distemper to his death which was a happy Euthanasia when he wanted onely 4 dayes of being 70 yeares old compleate. I was forced to haste into the Country to look after my affaires imediately'*.⁵⁶

That these affairs were not quickly settled is revealed by later letters, especially one written to the astronomer by one of his associates, George Kent of Cauldon, Staffordshire, on 6 December 1688.⁵⁷ Kent said that he had written several times before, but that the expected Articles of Agreement had not been signed; he now offered to act for Flamsteed in return for a twentieth share in his profit. There was at least one competing offer and Flamsteed's *'uncle Spateman'* (see below) was also involved in negotiations. Kent concluded by suggesting that Flamsteed might like to become a leaseholder of a copper mine in Ribden, where the owner was the Earl of Shrewsbury, but there is no evidence that the astronomer was attracted by this idea. One may guess that his recent experience of the complexities that could arise when there were various shareholders in a mine would easily have put him off extending his investments in such a way. His final comment to Kent about their present business was that *'I find my father was deceaved in some persons in London and I have cause to feare you are imposed upon by others in the Country. for you tell me you have diminished your partes to secure them. but you let me not know to whom. you would have me part with some of my Interest but you tell me not to whom neither. nor let me know how I shall be any ways more secure then I was, or am at present. My Councell who is also my Lord Shrewsbury's advises me not to diminish my shares. and assured me I that have such equity on my side as*

*will preserve them to me.*⁵⁸ He hints that he would be willing to launch a lawsuit in Chancery to defend his rights of ownership, and presumably this threat was sufficient to bring the matter to a conclusion, as nothing more is heard of it in his correspondence.

Ten years later, however, a new question arose. It appears first in Flamsteed's exchanges of letters with Luke Leigh, a Derbyshire mathematician who had begun to undertake calculating work for him and who reported hearing mention of Stephen Flamsteed as a past shareholder of mines. Flamsteed confirmed that this was true of *'severall Groves at Wirksworth. and particularly of one at Milcombotham of which he had great hopes so soon as the Sough might be brought up to drain of the water'*.⁵⁹ Having as yet found no record of this himself, he asked Leigh to investigate. After several further exchanges (with Leigh and others), Flamsteed felt confident enough to write a long letter to Thomas Bagshaw of Bakewell, an official of the Barmote Court, setting out his claim in the following terms. *'My father Steeven Flamsteed of Derby left me pos[e]st of some groves about Workworth that could not be then wrought by reason of water, about the begining of May last I received a letter of one Luke Leigh ...'* who had heard tell that a mine *'called Flamsteeds Founder was going then to be workd That it belonged to one Mr Flamsteed of London and if he did not come in and pay his proportionall part of Charges he would be dispossessed at the next barmoot Court'*. He (John Flamsteed) had discovered that the mine in question was on Cromford Moor, then unearthed his father's *'mine booke'* which showed he had *'freed a Founder Ap. 30 1683 with his owne name that he had a 3d and 12th part and a friend of his a 6th and that it was in a place Called Gell wheal Croft'*. He later asked Bagshaw for advice and help in asserting his rights.⁶⁰

Soon afterwards Flamsteed visited Derby and Wirksworth in person. Towards the end of September 1698, when he was back at Greenwich, he wrote to one of the business partners he had met with during his visit (unnamed and now unidentifiable), reporting that he had paid a sum of £3 6s 8d for *'my 6th Part of the Reconings at my fathers founder'* and would like news of the progress of the work. He also asked his correspondent to assist with persuading one Mr Morris of Derby to give some attention to an *'Interest in Millkombbotham where I have a 6th part of 6 Meers at the providence and in the Cross Rake'*; Flamsteed had spoken to Morris about this and been unable to obtain an answer, though he knew the shareholding had not been forfeited.⁶¹

Stephen Flamsteed's marriages and offspring

Through all these business activities, Stephen Flamsteed not only earned a livelihood but prospered. A few years after his father's death, he was evidently doing well enough financially to be able to marry. The nature of his two successive marriages gives an indication of his social and financial status: although he was only a third son, he was clearly regarded as a respectable match for daughters of well-established local families.

At the end of the *'Account of my Ancestors'* already quoted, the astronomer recorded:

*Steeven my father, who was borne at Little Hallam March the 12. 1617/18. died at Derby March 8. 1687/8 by his first wife Mary the daughter of Mr John Spateman of Derby he had me, and three other Children who died young. by his second Elizabeth the daughter of Mr [blank] Bates of Little Chester he had one daughter Katharine married to Mr Robert Imings of Marefeild in Leicestershie. Who died in Child bed leaving her daugther Anne behind her. he was buried in the Chancell of St Werburgh's Church in Derby.*⁶²

John Spateman, the father of Stephen's first wife, was a leading citizen of Derby (d 1671), living on Brookside, and had a very similar range of business interests to Stephen's: he is described as a maltster and an ironmonger.⁶³ He was long a burgess of the town (according to his own statement in a court case about trespass by horses on former common land in 1670), and was Mayor of Derby at the time of his death.⁶⁴ His eldest surviving son Samuel (1624-1700) also served as Mayor, three times (in 1667, 1676 and 1689). In the will made by John's widow, Elizabeth, in 1675 (proved 1676), he is described as *'John Spateman, gent.'*⁶⁵ Elizabeth died at Quicksall, Staffordshire, (the home of one of her daughters, who had married Edmund Brough of Quicksall) but mentions monies to be paid out of *'my howse in Darbie'*. She also tidied up a piece of business left unfinished by her late husband, making it the first item amongst her legacies: *'my will and mind is that Steevhen Flamsteed and John Flamsteed shall have thiere Legacies bequeathed and given unto them by my husband shalbe paid unto them and either of them according to his last will and testament'*.

This John Spateman's will has not been traced, but other probate documents show how the family achieved a similar kind of social advancement to the Flamsteeds in the course of the seventeenth century. Originating from the Derbyshire village of Tansley (just east of Matlock), with a William Spateman who died in the 1580s, they

were farmers who grasped the opportunity to make money from lead-mining.⁶⁶ William's son John Spateman of Tansley (d 1634) was classed as a yeoman, but the John of the next generation, the burgess and Mayor of Derby, was termed '*gent.*' as early as 1642. He signed the 1641 Derbyshire petition to King Charles just as John Flamsteed of Little Hallam did.⁶⁷ That second John Spateman had two younger brothers: George (d 1647), who continued to live at Tansley, and Samuel (d 1678), who eventually settled at Eastwood, Ashover. The wills left by both of these reveal their involvement in lead mining, and amongst several leases held by Samuel was the Eastwood one (*'for a reversion of 2000 years'*) worth £700. Whilst we have no similar evidence for elder brother John Spateman's wealth, we do know that he laid claim to a coat of arms, according to the heraldic Visitation of Derby compiled in 1662-63.⁶⁸

George's will, which survives in the National Archives, gave to his younger son, another Samuel (d 1659) '*all my parte of Groves or mynes of Leadoare within the parishes of Wirksworth, Matlock and Darley*'; he also left £80 for the creation of a school for '*poore Children*' in Matlock, and another £20 for local poor relief. Unusually, there is also evidence here of George's active support for the parliamentary cause in the Civil War: he left to Mr Leonard Watson (the husband of one of his daughters) '*all those moneys I lent upon the public faith*', comprising £50 '*to Sir John Gell for the Parliamentes service*', £22 10s to the town of Nottingham and £9 to Capt Greenwood. Furthermore, '*It is my will that my executors within named have that £300 which was taken from me by Mr Roger Mollinix late Governour of Winfeild Mannor when I was taken prisoner to Newark*'. This last event seems to have occurred in 1645, with the exchange of George for a royalist prisoner ordered in a letter written on 6 August.⁶⁹

George's second son, Samuel, of Tansley, also made a will (1659, proved 1660) mentioning lead mining: the profits of '*all my Leadmines called Groves*', with his lands, were to be administered by Samuel's widow Jemima until his sole heir was of age.⁷⁰ So, whilst it seems unlikely that George's executors succeeded in retrieving any of the sums he optimistically thought were owed to him, the family was not left without resources. George's elder son, John Spateman of Roadnook, Wessington (d 1681), was also connected to the lead trade, eventually owning two lead-smelting mills.⁷¹ And he too was a supporter of the Parliamentary cause, supplying money to the local commander Sir John Gell; as a result, Oliver Cromwell appointed him to the Commission of the Peace for the county in the 1650s.

The activities of John Spateman of Roadnook form the principal subject of an article published by a local antiquarian, Canon Prior, in 1915.⁷² Prior views Spateman as important primarily for religious reasons, because he registered his house as a Presbyterian chapel once toleration was established in the 1670s. The house was already familiar to many locals because its owner, as a Justice of the Peace, conducted marriages there in the 1650s; it appears that some people travelled long distances to take advantage of this. John died in 1681 and was succeeded at Roadnook by another John; this second John's son Samuel would have been the next heir, but he died a year before his father and the estate then passed to cousins. On Samuel's death he did not leave a will, but as a result there is a probate inventory (made in 1707), which reveals something of the family's life-style.⁷³ It includes a substantial amount of silver and fashionable household accessories: '*in the closet one plush cabinet, one pair of silver salvers and four silver potingers, eight silver spoons and a soup spoon, two chinah dishes, one Jocolate cup, Tey potts etc.*', also an old gold watch, a silver watch and two rings, two pictures, and '*Books in the library and elsewhere £5s.10s.*' Further down the list is evidence that a member of the family was a spinner of linen yarn, then '*one plush saddle housing*', a bridle, a case of pistols, '*one silver hilted sword & a small case of pistols*' and a further three guns. In the stable were two horses and two foals belonging to Samuel.

Their association with the Spateman family remained of some significance for the Flamsteeds, with '*uncle Spateman*' (presumably Samuel, the Mayor of Derby) cropping up from time to time in the astronomer's correspondence. But, sadly, Mary herself died a few years after her marriage to Stephen Flamsteed - in September 1649, following the birth of their daughter Elizabeth. Her eldest child John was then just three years old, and according to John's later notes there were two other children of this marriage, who '*died young*'.⁷⁴ One was Mary, born after John and before Elizabeth, and baptised at St Werburgh's church in Derby on 15 August 1648. I have been unable to trace any other in the parish records: he or she presumably died at birth or in very early infancy, some time in 1647. Elizabeth lived longer but died some time between 1663 and 1676, probably in the mid 1670s.⁷⁵

It should, incidentally, be noted that we only have the astronomer's word for it that he was born in Denby. He left an additional explanatory note: '*My father removed his family to Denby because the sickness was then in Derby*'.⁷⁶ (That is usually taken to mean plague, but could refer to some other epidemic disease brought on by the disruptions of civil war.) The parish register of that period survives but is severely damaged and minimally

legible; John Flamsteed's name is not traceable in it.⁷⁷ In 1897 local historian the Rev. C. Kerry stated that '*according to the best traditions, the astronomer was born at an old stone mansion at the 'Crow Trees' by the bridle road leading from Denby to Smalley, demolished about fifty years ago*'.⁷⁸ This assertion has since been repeated by Mark Fryar in a book about Denby, where he further identifies the house as located about 500 yards south-east of Denby church, and as having been taken down some time between 1866 and 1880.⁷⁹ It can reasonably be deduced that it was a house associated with the Spateman family, as the relevant marriage entry in Morley parish register refers to Stephen Flamsteed of Derby and '*Mary Spadman of Denby*'.⁸⁰

Three years after Mary's death Stephen Flamsteed married again. His second wife was Elizabeth, the daughter of Nathaniel Bate(s) of Little Chester. Little Chester was the old Roman core of Derby, and lies a little way north of the present city centre; in the seventeenth century it was part of the city parish of St Alkmund. Nathaniel was undoubtedly regarded as a gentleman: his heir Richard recorded a brief pedigree in the *Visitation of Derby* in 1662-64.⁸¹ Nathaniel had two wives and at least twenty children, and Elizabeth was one of the younger daughters in his second family; her father had died by the time of her marriage. The terms of her father's will gave her a sum of £150, ten pounds of this being payable on her marriage; she and her sisters were to receive their legacies only if their mother judged they had behaved themselves well.⁸² The legacies were also conditional upon there being enough money in the estate to pay them, though the sums might also be increased if there was a surplus. It is impossible, therefore, to know exactly what financial resources Elizabeth had at the time of her marriage, but she was clearly of a respectable status.

Very sadly, Elizabeth Bate(s) proved as susceptible to the infections associated with childbirth as her predecessor. She died in November 1654, soon after she had given birth to her only child, daughter Katherine. Katherine survived to grow up and marry Robert Heming (or 'Imings'), a Leicestershire man. After her death, their daughter Ann was to live with John and Margaret Flamsteed at the Observatory as their adopted daughter.

Other relatives and associates of Stephen Flamsteed and his son John

A scattering of items amongst the astronomer's published correspondence points to other family relationships. Amongst the earliest is a Latin memorandum, dated 26 March 1670, inscribed at the front of a printed book: a copy of Vincent Wing's *Astronomia Britannica* (London, 1669).⁸³ This records that Flamsteed had received the book as a present from a '*most friendly relative*' (cognatus amicissimus), John Potterell of Oakham, Rutland. It was a generous gift, being a substantial volume that any aspiring young astronomer would very much wish to own. The exact nature of their kinship has previously been unclear, but evidence in the will of another relative, Edward Potterell of Derby, proves that John was the husband of the astronomer's cousin Elizabeth, daughter of John Flamsteed of Little Hallam.⁸⁴ They were married on 25 June 1655.⁸⁵ In making John Potterell his principal heir, Edward Potterell refers to him as his nephew and not only states Elizabeth's parentage but describes her as '*my late wifes near kinswoman*'. There was an earlier John Potterell, whose will (2 November 1652) reveals his endeavours to establish a dynasty of apothecaries in Oakham; he must have been the brother of Edward and father of the younger John.⁸⁶

Edward and the elder John Potterell seem highly likely to have been related to the Potterell/Powtrell family, who were lords of the manor of West Hallam from the late 15th century to 1666, though Edward's residence in Derby and trade as a maltster would in itself have been enough to bring him into contact with the Flamsteed family. The record of his marriage survives, in the register of All Saints, Derby: he married Elizabeth Bentley in December 1620. The strong probability is that this Elizabeth was the sister of Mary Bentley, the wife of John Flamsteed of Little Hallam, in which case the phrase '*my late wifes near kinswoman*' would mean '*my late wife's niece*'.

A letter written later in the astronomer's life, in March 1699, shows him discussing family financial matters with John Richards, the son of Elizabeth (Flamsteed) Potterell's sister Anne, who had married Samuel Richards, a bookseller.⁸⁷ The document is directed '*To Mr John Richards Bookseller at his house over against the Cross in Nottingham*' and concerns money intended to support '*Coz. Flamsteed's Widdow's Daughter*' - which must mean Mary, the youngest daughter of William Flamsteed of Little Hallam. William had died in 1693, but his widow Mary (Lowe) was evidently still alive; the astronomer suspected that she might try to persuade her daughter to hand over some of the money to her, so he hoped it could be secured in such a way that this would be prevented. One '*Coz. Coates*' also had some claim on it but an agreement had been reached with him, leaving Mary with the substantial sum of £300. The identity of this additional cousin has not been exactly established, but he was perhaps a relative of Roger Coates of Chesterfield, whose will (1695) appoints John Spateman as an executor.⁸⁸

Another kinsman cited several times in the astronomer's early letters was Thomas Wilson of Codnor (situated in Heanor parish, Derbyshire, a dozen or so miles from Derby). They seem to have been connected with each other through the Spateman family, as Elizabeth Spateman's will in 1676 mentions a Mary Wilson as her grand-daughter. Unusually, Thomas was not only John Flamsteed's kinsman but an amateur astronomer: in 1670 he observed the occultation of a star by the moon, ordered a quadrant to be made for him by the London instrument-maker John Marke, and observed the planet Venus passing close to the moon. Flamsteed initially had enough confidence in these observations to pass the figures on to others, but soon decided that Thomas had not recorded the times of the events sufficiently accurately. In the following year Flamsteed wrote to his '*Coz: Willson*' asking for help in buying a cheap pendulum clock (implying that Wilson owned one himself, or was planning to buy one), though it turned out that even a cheap one would be too dear. In visiting London, Wilson left one of Flamsteed's letters to him with the Royal Society's secretary Henry Oldenburg; it is hinted that he had also personally corresponded with Oldenburg, though no such letter survives.⁸⁹

Some impression of Wilson's social status and level of prosperity can be derived from his will, drawn up in 1692 and proved in 1694.⁹⁰ It describes him as a yeoman, and specifies legacies in shillings and a few scores of pounds. The principal beneficiaries were his daughter Mary and her husband Samuel Spencer, and two of their sons, one of whom was to pay the other £70 in return for taking sole custody of some tithes; this is the largest sum mentioned. There was one bequest of £60, to a grand-daughter. All the rest were small bequests, of ten or twenty shillings each, going to a variety of other relatives and children of relatives. Plate and books, with the specific exception of mathematical books, went to grandson Thomas Wilson Spencer, and '*all my mathematicall bookes and instruments*' to '*kinsman*' John Harris. Another granddaughter, Mary Spencer, came in for '*all my copper and pewter and brass*', and one close of land; these were presumably reckoned to roughly match the value of the threescore pounds received by her sister Elizabeth. The next largest sum mentioned was five pounds to be distributed amongst '*forringe ministers*', and there was a charitable gift of four pence each to the '*poore indigent widdows*' of Codnor. So this adds up to a relatively modest estate, left by a man of equally modest social status. Only his possession of mathematical items marks him out as different from the other yeomen farmers of the district. Perhaps it was the example of John Flamsteed the astronomer that had encouraged him to branch out in that direction?

One other family seems very likely to have been connected to the Flamsteeds by marriage, though the precise link has not been identified. This was the Willoughby family of Cossall, Nottinghamshire - a parish just over the county boundary from Ilkeston. Their senior branch lived at Wollaton, Nottinghamshire, a short distance further eastwards (Cossall parish church was a chapelry of Wollaton). Edward Willoughby of Cossall (c1592-1642) was the second of the six sons of Sir Percival Willoughby of Wollaton (d 1643).

A family memoir written later by relative Cassandra, Duchess of Chandos, preserves a few details of the junior branch of the family.⁹¹ '*By the old letters and papers one may judge that Edward Willoughby, the second son of Sir Percivall, was educated just like his eldest brother, Sir Francis, only taught such generall learning as became a fine gentleman, and not brought up to follow any profession.*' His mother made sure he was provided with a substantial share of the family estates, as he was her favourite child, and '*Sir Percival settled upon him an estate at Cossall which the family still enjoys, and which has produced to them a very considerable estate in money from the cole which has been got upon that ground. George, the son of this Edward, I believe, might, for the cole which he got there, have received at least ten thousand pounds. This estate was also very well wooded, which has been very profitable to the family.*'⁹² (Coal was also mined on a substantial scale on the Wollaton estate, where the '*Wollaton Wagonway*' is sometimes credited with being the country's first overground railway.⁹³

Cassandra noted that in 1615 Edward married Elizabeth, the daughter and sole heir of John Atkinson of Nottingham, '*Esquire and Physitian*'.⁹⁴ '*She was a Roman Catholick, but concealed her religion from her husband so long as he lived. Soon after his death she professed herself so, and tho her children were all grown up to years of discretion before their father dyed, and had been brought up protestants (the sons at the University) yet their mother had then influence enough over them to make them all change their religion and turn Roman Catholicks.*'⁹⁸

Edward and Elizabeth had three sons and three daughters. The eldest son, George (c 1627-) attended St John's College, Cambridge and then returned to live at Cossall (Cossall Wood Hall). The second son Francis also went to St John's, but then undertook a period of training as a lawyer, at Gray's Inn and the Middle Temple. Cassandra says he '*studied the law and grew rich by his practise, but never married.*'⁹⁶ The third son, Edward, settled at Aspley, on a small estate bought for him by his brother Francis. (Francis Willoughby of Cossall is not to be confused with those of the same name in successive generations who lived at Wollaton: Sir Francis Willoughby,

1588-1665, his son Francis Willoughby, F.R.S. 1635-1672, and his son Sir Francis Willoughby, 1st Baronet, 1668-1688.⁹⁷)

Edward and Elizabeth's eldest daughter, Bridget, married into the Ferrers family of Baddesley Clinton in Warwickshire (related to the Ferrers who were once Earls of Derby). A clutch of surviving family legal documents concern settlements made for the support of the children of Henry Ferrers, in January and February 1669, and these show Francis Willoughby of Cossall, John Flamsteed of Little Hallam and Stephen Flamsteed of Derby acting together as trustees for the relevant lands.⁹⁸ Both Willoughby and John Flamsteed lent money to Henry's son George through mortgages held on parts of the property, and later Stephen Flamsteed became the owner of some copyhold lands in Rowington, probably by a similar route.⁹⁹

There are hints in the Middleton papers that a Flamsteed was a tenant of the Willoughbys for land in Trowell, and close Willoughby-Flamsteed business links are indicated by a group of documents that survive in Chancery records. In one small batch, dating from 1684, John Flamsteed and Francis Willoughby are cited together as defendants in a matter concerning coalmines in Ilkeston, and West Hallam; in the others, from 1686 and 1687, Stephen Flamsteed, William Flamsteed, Edward Willoughby, Francis Willoughby, George Willoughby, William Horne and William Reason are again cited as defendants in a case concerning coal mines in the manor of West Hallam.¹⁰⁰

It comes as no surprise, therefore, that similarly close links are indicated in various probate documents. John Flamsteed of Little Hallam was named as an executor to Edward Willoughby in 1642; Edward had owned the advowson of West Hallam church, and some twenty years later Flamsteed as executor exercised the right to appoint a clergyman (Robert Horne) on his behalf.¹⁰¹ In October 1670, '*Francis Willoughby of Cossall, gent., John Flamsteed of Little Hallam, Derbs., gent., [and] William Horne of West Hallam, Derbs., gent.*' served together as the executors of Anne Powtrel of West Hallam, widow.¹⁰² John Flamsteed's will (drawn up in 1684, proved 1686) mentions a cottage and croft bequeathed by Robert Willoughby to support certain charitable donations; Francis Willoughby had therefore surrendered the property to Stephen Flamsteed, while John had the disposal of surplus profits (which he now gave to the clergy and poor widows of the parish).¹⁰³ Nearly a decade later, in 1693, Francis Willoughby (*the elder*) of Cossall was one of the supervisors of the will of William Flamsteed (along with the testator's nephew-in-law John Lowe).

The Flamsteed family house in Derby

The house at the present 28 Queen Street, Derby, was built on a site which Stephen Flamsteed appears to have purchased in 1669. Its character and subsequent history have been described in some detail by local historian Maxwell Craven, both in a book about a later occupant of the site, John Whitehurst, and elsewhere.¹⁰⁴ Craven regards it as a fairly typical early example of the kind of substantial houses that began to be built in Derby after the Restoration, as the town's prosperity grew. He tells me that English Heritage has declined to list the house, on the grounds that the building has been several times rebuilt and much modified, with the result that few of its original architectural features remain.¹⁰⁵ The whole frontage was demolished and rebuilt as part of a road-widening scheme in the 1920s. The house is now owned by a property developer, and is consequently unoccupied and suffering from neglect; it was the subject of several press articles in 2014, which tried to raise local awareness of its potential and suggested that it could be suitable for conversion into a museum, but at the time of writing nothing has been settled.¹⁰⁶ Derby Civic Society has recently provided it with a blue plaque commemorating the successive occupants of the house.¹⁰⁷

The astronomer's education

John Flamsteed's autobiographical writings tell us a good deal about his education, and the other influences that led to his becoming skilled in mathematics and astronomy. It is clear that his father played an important role in this at an early stage, through some direct teaching and through an element of heredity which gave the young astronomer confidence in the face of his father's doubts about his activities. He commented: '*My studies were discountenanced by my father as much in the beginning as they have been since; but my natural inclination forced me to prosecute them through all impending occurrences. And indeed I think this mathematical quality no other than innate unto me, my father in his younger years having been as much affected with arithmetic as I at present with geometry and astronomy.*'¹⁰⁸

John's experience at Derby Free Grammar School (where attendance was free for the sons of burgesses of the town) seems to have contributed nothing beyond a basic classical education; it does not appear to have been one

of the establishments where a master offered optional private teaching in mathematical subjects, as occasionally occurred elsewhere.¹⁰⁹ No school register survives from the relevant time, but John is believed to have been admitted in 1655, making him one of seven boys known to have arrived during the headmastership of Richard Brandreth (1652-56).¹¹⁰ Brandreth was a local man who had attended Repton School and Christ's College, Cambridge, then eventually returned to teach in Derby.¹¹¹ His successor was George Hill, M.A., who may also have been a Cambridge man.¹¹²

John Flamsteed states that at school he learned '*so much Latin as might make me understand an elegant English*'; when he first attempted to write letters and papers for the Royal Society it became clear that his skill with Latin itself needed further practice.¹¹³ His own inclinations led him to start reading romances and eventually higher-class romances and history-books (on Roman and English history), Heylin's Geography, '*and many other of the moderns*', all which he had consumed by the age of fifteen.¹¹⁴ Because of ill health (a rheumatic complaint, apparently acquired through swimming in '*Lord Aston's baths*' beside the river Derwent) he left school in May 1662, that is, before he was sixteen, and did not follow his school companions to university.¹¹⁵ He felt a lingering regret about this, though he understood and accepted that his father wished to keep him at home to help run the household and business.

There is an indication that this business arrangement involved some kind of formal indenture of service, as in 1673 he wrote to Henry Oldenburg: '*My father will not allow me Monyes for a Pendulum clock nor can I, knowing how indulgent hee is otherwise, presse him this which hee had once denied. but must rest contented for a while till hee shall dismissee mee which hee has promised ere twelve moneths be over And allowed mee that liberty which is necessary for a course of life I more affect. I meane these and my other studies.*'¹¹⁶

Soon after John left school, someone (unnamed) lent him *Sacrobosco's Sphaerae* (in Latin), which was a standard text for learning very basic astronomy, old but often reprinted. He read this, he says, '*without any director in it, but not unsuccessfully. For here I laid a ground of my mathematical knowledge, and in that winter, before Christmas, my father taught me arithmetic, with the doctrine of fractions and the Golden Rule of Three, direct and converse.*'¹¹⁷ Then he read Fale's *Art of Dialling*, and with its help calculated solar tables and made himself a small quadrant, '*of which I was not meanly joyful.*'¹¹⁸ On 12 September 1662 he made observations of a solar eclipse.

In the summer of 1663 he met a local man called Elias Grice, who told him about published mathematical tables and showed him Wingate's *Canon* (Edmund Wingate was a well-known author of arithmetics). It happens that a long dynasty of successive Elias Grices lived in Derby (with a variously spelled surname - also Grise and sometimes Greece or Grace), in the parishes of St Alkmunds and All Saints, and it is impossible to be absolutely sure which of these was Flamsteed's friend; but it seems most likely that it was the one who left a will made on 12 December 1690 and proved on 17 April 1691.¹¹⁹ This describes the testator as a mason by trade, and gives to his wife Elizabeth '*All the household goods that are mine, books, writings and implements* that are in the Deske, debts and Masons tooles only excepted*', with the asterisk pointing to a marginal note: '**Vizt Rules Compasses and pencells for drawing*'. This sounds very plausibly like a man who was keen on mathematics. He left three sons, Paul, John and Job, the last of them being still an apprentice and Paul the principle heir and executor. Only small sums of money are mentioned, and an accompanying inventory of his modest household goods valued them at only £12, with £1 10s of that for '*some Grave stones and other stones in the yard*'.

Around the time that he met Grice, Flamsteed also read Stirrup's *Art of Dialling*,¹²⁰ saw Edmund Gunter's *Sector and Canon*,¹²¹ and '*soon after I acquired Oughtred's Canon of mine own*'.¹²² These he skimmed through rather than read in detail, as he felt the lack of a teacher who could explain the obscurer terms.

Fortunately, further help was at hand. Flamsteed recorded: '*This year [1664] I also became acquainted with my friends Mr George Linacre and William Litchford. I affected the friendship of the former because of his knowledge of the fixed stars (few of which were unknown to him, and by whom I learned those few I know); of the latter for his knowledge of the erratic, and judgments on them. Somewhile it was ere that he would admit me that knowledge of his studies after our first acquaintance; but that day when he confessed it unto me, he also told me ... that he had calculated (and could promptly do it) the places of the planets to a given time by the tables in Mr Gadbury's works. (Horrox's Tables, published by Mr Shakerly, but perfected and reduced to current account by Mr Gadbury).*'¹²³ This led Flamsteed to look for an equivalent source of data and buy himself a copy of Thomas Street's *Caroline Tables*, '*because I would not be seen with Mr Gadbury's book, lest I should be suspected astrological.*'¹²⁴

George Linacre of Derby can be securely identified. He was the son of George Linacre of Plumley, who married as his second wife Ann Lister, daughter of Anthony Lister of Little Chester.¹²⁵ The earlier pedigree of the Linacre family is not accurately known, but they were long established as landowners in the county.¹²⁶ Their name derived from the manor of Linacre in Brampton, which lies to the west of Chesterfield; they also came to hold property in the north eastern part of the county, in Eckington and Plumley. It was presumably through his mother's connections that the younger George came to settle in Derby; after his father's death she made two further marriages, the last of which was to Samuel Goodwin of Derby. While a half-brother inherited Plumley, the younger George seems to have become a woollen-draper and moderately prosperous on his own account - he was '*Mr George Linacre of the parish of St Werburgh, Derby, gentleman*' when he drew up his will in 1703.¹²⁷ He had married twice but had no surviving wife or child; consequently he earmarked part of his property for setting up a charity for apprenticing two poor boys per year, while leaving his house and the residue of his estate to members of the Goodwin family.¹²⁸

The identity of William Litchford is harder to pin down. He was probably related to John '*Lichford*', a saddler, who lived in Sadlergate, Derby, and left a will, made in 1637 and proved in 1641. There was a William Litchford who was a member of the Mercer's Company in Derby on its foundation in 1675 (the company took in men from a variety of trades), along with Abel Litchford, an apothecary (evidently his brother); William was a churchwarden of St Michael's parish in 1677.¹²⁹ It seems a reasonable conjecture that this was the same person as the William Litchford of Derby who left a will made (October) and proved (November) in the autumn of 1689. As the will mentions Greaves relatives, the testator must have been the William Litchford who obtained a marriage licence and wed Elizabeth Greaves at Arnold, Nottinghamshire, on 18 October 1683. The bond associated with the marriage licence gives a little more information: the groom's occupation is stated as '*ironmonger*', of Derby, and he was a bachelor 38 years of age.¹³⁰ This would mean he was born around 1645, and would thus have been just fractionally older than John Flamsteed. Associated with him in the bond was John Litchford of Derby, '*saddler*' ('*ephippiarium*'), who was presumably either his father or a brother and the heir of the John Litchford who died around 1640. A Robert Litchford who issued a copper halfpenny as a trade token in 1669 and died in 1671 represents the intervening generation.¹³¹

There are unfortunately no clues as to where either Litchford or Linacre acquired their knowledge of astronomy and astrology. It is entirely possible that they began close to home by learning the kind of arithmetic that was useful for tradesmen and by reading the kind of books that the young Flamsteed read, but equally possible that they encountered more sophisticated aspects of mathematics and astronomy through links with London. Either of them could have had reason to travel there fairly regularly for business purposes. For a comparison one might turn to William Crabtree (1610-44), who lived in Lancashire, sold cloth at Blackwell Hall in London and became an enthusiastic amateur astronomer.¹³²

The joint influence of Litchford and Linacre on the young John Flamsteed is clear. By his own admission: '*I spent some part of my time in astrological studies, but so as my labours were rather astronomical. Amongst others I spent some time on Mr Linacre's and another great person's schemes ... In fine, I found astrology to give generally strong conjectural hints, not perfect declarations.*'¹³³ The continuing closeness of the friendship between Litchford and Flamsteed also emerges from remarks in Flamsteed's correspondence and autobiographical writings. In 1665 he set about writing '*the construction and uses of a quadrant*' and ruler for the latitude of 53 degrees, and '*performed it for my loving friend William Litchford*'.¹³⁴ Later in the year he compiled an extended version, entitled '*Mathematical Essays*', '*which I had left in the hands of my friend W. Litchford, and intended for him, and I gave it him when I had finished it*'.¹³⁵ Additions included an appendix with a projection of a universal dial and a catalogue of 70 fixed stars to the year 1701, taken from Tycho's data. That his friendship with Litchford continued for some years more is indicated by a request in a letter he wrote to the London mathematician John Collins on 16 July 1670: '*As for my glasses I desire you when you write any thing about them direct your letter to Mr William Litchford Ironmonger in Derby so will they come to my hands safe: for letters come to me often on my father's business which he commonly opens in my absence. ... my freind who is my sole adjutor knows your hand and will deliver them unopened.*'¹³⁶

In the spring of 1666 Flamsteed made a new acquaintance who was also to prove an important friend and patron in his pursuit of astronomy. This was Imanuel Halton (1628-99) of Wingfield Manor, who had just settled in Derbyshire as part of a career serving the Howard family (following his father, who had been steward of their Cumberland estates).¹³⁷ After attending Gray's Inn in London and spending some years as Henry Howard's agent in the Netherlands, Imanuel then became auditor of his household; Howard recompensed him with gifts of land in Derbyshire, where Halton continued to manage the Howards' local estates. The palatial medieval mansion at South Wingfield had been severely damaged and then slighted during the Civil War; but Halton was loaned it

and eventually owned it, had the great hall reroofed, subdivided and made habitable, and was to live there for the rest of his life.¹³⁸ Some of the elaborate sundials he constructed can still be seen there.

Flamsteed describes him as '*a person of great humanity and judgment, a good Algebraist, and endeavoured to draw me into the study of Algebra*'; he was also, in a minor way a published mathematical author, having composed *A short description of reflected dialling* and *A new Triquetrium or the Parallactick Instrument improved*, which was sold with John Twysden's edition of Samuel Foster's *Miscellanies* (London, 1659).¹³⁹ He is known to have been interested in astronomy from the 1640s, while he was at Gray's Inn; in 1650 he wrote a letter to the Gresham Professor of Astronomy, Samuel Foster, and there mentions that he had owned an astronomical quadrant but had been unable to take it with him on his travels.

It was Flamsteed's cousin Thomas Wilson who first made his name known to Halton, and one spring day '*at Lenten assizes 1666 on the Sabbath after the evening prayers*' Halton paid him a visit in Derby.¹⁴¹ Flamsteed showed him some of his papers, including a set of calculations concerning the solar eclipse due on 22 June 1666 (which, in another version of this story, had already been shown to Halton by Wilson); Flamsteed promised Halton a copy of this, and a copy of '*a canon of natural and artificial Versed Sines, which he much commended*'.¹⁴² Not long afterwards Halton called in for a second time, and began to talk about lending books. He proved as good as his word, supplying a copy of Durret's *Richleian Tables*, Kepler's *Rudolphine Tables* and the first volume of Riccioli's *Almagestum Novum*. The last Flamsteed was especially grateful to see, initially because of information it gave about calculating solar parallax; he read it in detail through the following winter. Whilst not agreeing with all Riccioli's methods, he made good use of the volume in work on the sun's course and the equation of time, which he set out '*in a letter of three sheets to Mr Halton*'.¹⁴³ A version of this was eventually published.

Flamsteed made a formal Latin note of the date of Halton's first letter to him, which stands as the first item in his published *Correspondence* (though the text of the letter does not survive). This is an indication of how much he appreciated the potential value of this new relationship, as Halton's patronage gave him access to astronomical and mathematical works published on the continent to add to those that circulated more readily in England. Not only Latin publications were in question here: Halton, having lived in the Netherlands, undertook to translate a volume from Dutch (as '*Kinkhuysen's Moon-Wiser*') so that Flamsteed could read it. Their friendship continued to some degree after Flamsteed was appointed the king's astronomer, Halton visiting him at Greenwich in 1682.¹⁴⁴

Conclusions

The details assembled above reveal much of what the '*integrity, honesty and fortune*' with which the astronomer John Flamsteed credited his forebears meant in the context of seventeenth-century Derbyshire. Integrity and honesty were qualities displayed primarily in the conduct of business dealings, and the resulting fortune was substantial enough to support the family's social rise from the yeomanry to the gentry. Although Flamsteed noted that his father did not fully approve of his devotion to astronomy and on one occasion refused to allow him £5 to buy a pendulum-clock, he also praised God '*for that he hath afforded my father a competent means and fortune to maintain me; whilst to a meaner man I might have been a burthen - nay (without a mighty Providence), an undoing*'.¹⁴⁵ Smaller sums seem to have been readily available to him: he was able to obtain books, sometimes by outright purchase, and to secure the materials to make himself a quadrant.

This transition to greater prosperity and social status was experienced by many Derbyshire residents through the middle decades of the seventeenth century. The county gained significant economic benefits during that period, while it suffered little physical damage during the Civil War; when local troops engaged in military action, it was usually in neighbouring counties rather than closer to home. There was relatively little social upheaval, beyond the decline of some royalist gentry families from the northern part of the county and, under Cromwell, the rise of a few parliamentarian sympathisers of relatively humble origins who were appointed to the County Committee. While the local commander Sir John Gell (1593-1671) held the county for parliament in the early years of the war, he was regarded by some contemporaries - and is now seen by historians - as an opportunist devoted first and foremost to advancing the interests of himself and his family, landowners whose wealth derived chiefly from the lead-mining industry. His Presbyterianism initially led him to sympathise with some of the aims of the parliamentary party, but he had no time for the more extreme forms of religious and political radicalism. He thus dissociated himself from the regime that emerged after 1646; a couple of years later he moved to London and became reconciled to the King. He did not return to Derbyshire.¹⁴⁶

Meanwhile, the county town of Derby was no provincial backwater. The acquisition of a new town charter in 1637 - replacing government by bailiffs by a broader organisation made up of a mayor, aldermen, 'brethren' and common councillors - marked a stage in the growth of its prosperity and self-confidence, and it continued to do well through the following decades. When a new Mercers' Company was founded there in 1676, on the model of earlier guilds (and with similar intentions with regard to maintaining restrictive practices), about fifty local tradesmen joined its ranks and there were three times as many outside it.¹⁴⁷ The biggest identifiable trade groups within it were those of the mercers, ironmongers, apothecaries and grocers. By the 1690s, according to economic commentator John Houghton, the town contained nearly 700 houses, occupied by about 4,000 people, with 42 separate trades represented amongst them. There were some 76 maltings and 120 alehouses.¹⁴⁸ Later in the century, the appearance of many new houses of fashionable design in the principal streets (like the one built by Stephen Flamsteed) led Daniel Defoe to describe Derby as essentially a genteel place. But this is misleading: the new buildings were paid for largely by the profits of trade and industry, and many of the related economic activities were still taking place within the town.

The county as a whole suffered some effects of physical remoteness: the roads were bad (in the north of the county especially, most carriage of goods required pack-horses); the River Derwent had for centuries been used as a source of power, but it was not until the early eighteenth century that it was to be improved for water transport. Nevertheless, Derby itself was well-placed geographically - at the junction of routes to London and the sea ports - and its industrial and trading activities meant that many of its inhabitants had regular contact with these places. There is evidence that Stephen Flamsteed visited London occasionally for business reasons, and when his son wished to send letters there in the early 1670s he had no difficulty in finding relatives or friends who were travelling and could carry them for him.

The mining industries also drew people into the district from elsewhere, even from overseas: in the mid sixteenth century, German technical experts were brought in to the lead-mines and granted privileges by the Crown in return for their assistance with all forms of mechanisation, especially for pumping and drainage; and a little later these were joined by a group of Flemish iron-workers.¹⁴⁹ After Elizabeth I signed Letters Patent allowing the immigration of up to a hundred foreigners (1565) to work in the mines and metal industries, another German arrived and developed a method of drawing iron wire, which had many uses including the making of better sieves for washing lead ore. In the following century the area's potential attracted the attention of outside investors, including the Vermuyden family with their Dutch and English commercial contacts.

It is clear that by the mid seventeenth century Derby was well established as a place where mathematical and technical skills were greatly valued. It should come as no surprise, therefore, that such a milieu produced John Flamsteed as an enthusiastic and technically-minded astronomer. In the same way that his patron Jonas Moore had benefited in his early life from contact with the Shuttleworth family of Gawthorpe and Towneleys of Carr Hall and Towneley (all in Lancashire), and with their library collections, Flamsteed himself enjoyed access to books and personal guidance in matters mathematical and astrological/astronomical from his teenage years.¹⁵⁰ His family's status and prosperity were sufficient to enable him to join a networking community of people from a variety of social backgrounds - from Grice the stonemason or Thomas Wilson the unpretentious yeoman to Halton the well-established gentleman. Whilst some of the books Flamsteed needed could be obtained in Derby (at least one bookseller was operating there in the 1660s, and names of others are known from the 1670s and '80s), it was Halton, ultimately, who supplied the titles that raised his knowledge and skills to the level that might be expected of a prospective astronomer royal. In effect, access to that kind of gentleman's library provided equivalent resources to those that might otherwise have been obtained by attending a university.

Although Flamsteed eventually (in 1670) secured notional admission to Jesus College, Cambridge, and went on to obtain a Cambridge M.A. degree (1674), the latter honour was achieved *'per literas regias'* - that is, by royal mandate - and on the strength of his existing record as an astronomer. His main motive for doing this, as comments in his autobiographical jottings make clear, was that the university connection would help to qualify him for a clerical career. He went on to be ordained deacon, though astronomy then took over his life in such a way that he did not secure a church living and proceed to ordination as a priest for a further ten years.

He resided in college only very briefly, for a couple of months in 1674, and during that time wrote a long letter to his patron Sir Jonas Moore. The letter was full of astronomical data, demonstrating, he said, that he was *'propense to the old amidst the avocations and resolves I had made of new studies'*; he intended to set up one of his telescopes. He mentioned intending to call on Isaac Newton to consult him about atmospheric refractions, but as he says nothing further about this in any subsequent letter one must assume it came to nothing. In conclusion,

he said that '*I shall soone be aweary of Cambridge*', and that only the company of a '*very dextrous Anatomist with whom I am resolved to learn a little of that knowledge*' made the place '*not intollerable*'.¹⁵¹

Had the circumstances of Flamsteed's life in his teenage years been different - had he had better health and a less demanding father, and consequently been able to attend university at the conventional time - he might have turned into rather a different kind of astronomer: more bookish, less practical, less keen on fundamental positional astronomy, more inclined to indulge in philosophical and cosmological speculations, perhaps more sophisticated in his understanding of mathematics. But, as it was, in the absence of such academic influences, his character as an astronomer was clearly created wholly by his experience of growing up in Derby. This made him mathematically competent enough, concerned with improving his technical and observational skills and applying them to assessing the reliability of existing astronomical tables, and eventually to the improvement of instrumentation. The advance of observational accuracy for the production of fundamental data was his primary aim. He was thus very well equipped to take advantage of the opportunities that arose once he extended his horizons to London and became known to the Royal Society and to Sir Jonas Moore.

References

1. E. G. Forbes, L. Murdin and Frances Willmoth, eds, *The Correspondence of John Flamsteed, the First Astronomer Royal*, 3 Vols, 1995-2001, Vol. 1, p904.
2. *Ibid*, p906 for the warrant.
3. Francis Baily, *An Account of the Reverend John Flamsteed, the first Astronomer Royal; compiled from his own manuscripts and other authentic documents, never before published*, 1835.
4. Cambridge University Library, Royal Greenwich Observatory Archives (CambUL), RGO 1/32A.
5. *Ibid.*, RGO 1/16, f. 185v. For concluding details of the astronomer's father Stephen, see below (ref 62).
6. Ilkeston court rolls Bundle 3: courts of 11 May in the 10th year of Henry VII, 25 Oct. in the 19th year of Henry VIII, 29 July in the 21st year of Henry VIII, and others throughout the reign of Henry VIII. I am very grateful to Lord Manners for giving permission for Kate Henderson (record agent) to examine and photograph these documents on my behalf.
7. The original map is with manorial records at Haddon Hall. I am very grateful to Lord Manners and to Ruth Headon, his Estate Manager, for supplying a digital photograph.
8. P. Stevenson, ed, *Maps and Plans of Ilkeston, 1598-1885*, Ilkeston & District Local History Society (IDLHS), Occasional Paper no 5, 1975. The original is cited there as Belvoir Castle, map 61.
9. Amongst 21 names. Nicholas Daye is also in this list.
10. The size of the customary '*oxgang*' or bovate varied across the country, from 15 acres upwards, according to the varying quality and nature of land. It was taken as equivalent to half a virgate or an eighth of a carucate (or ploughland). Some later Derbyshire evidence (in White's *Directory of Derbyshire*, 1857) suggests an oxgang of 28 acres. A '*dole*' was a portion of a common field.
11. Derbyshire Record Office (DRO), D4891; Stevenson, *Maps*, (ref 8 above), pp 10-13.
12. Stevenson, *Maps*, (ref 8 above), p27.
13. R.A. Horton and Mary Bingham, Little Hallam Hall, c2008. www.geograph.org.uk/photo/1881571: photograph. A painting by Arthur Sulley, held by Erewash Museum, is reproduced on www.bbc.co.uk/arts/yourpaintings/paintings/little-hallam-hall-ilkeston-derbyshire. For listing information www.britishlistedbuildings.co.uk/en-352260-the-hall-the-old-hall-derbyshire#.Vm16-VPnlv4.
14. See www.geograph.org.uk/photo/1881562.
15. A comparison of dates makes this appear the most likely relationship between them. The fact that when John made his will he was the father of young children suggests he was not of Robert's generation.
16. Irene M. Edwards, *The courts of the manor of Ilkeston from 1559 and their gradual decay*, IDLHS Occasional Paper no 3, 1971, p15.
17. *Ibid.*, p6. George and his wife Isabella (Stray) both died at around the same time and were '*buried in one grave*': DRO, D3082 A/P1 1/1, Ilkeston parish register.
18. He also appears in the manorial rentals as holding '*one croft called Harehill*', of 8 acres, at a very substantial '*improved*' rent: Manorial Records, Haddon Hall, Ilkeston F4 1608.
19. The Willoughby family papers are held at Nottingham University Library as the Middleton Collection (Dept of Mss and Special Collections, Mi 1-7) (NULMss): they became Barons Middleton in 1712. www.nottingham.ac.uk/manuscriptsandspecialcollections/collectionsindepth/family/middleton. The William Flamsteed reference comes from Mi 2/66/3.
20. <https://mosleyfamilies.net/genealogy/getperson.php?personID=I4579&tree=tree1>; Lichfield Joint Record Office (LJRO), B/C/11 Day 1612.
21. Irene M. Edwards, *The courts of the manor of Ilkeston*, IDLHS Occasional Paper no 3, 1971, p7.

22. DRO, D3082 A/P1 1/1 CMB 1588-1717, Ilkeston parish register and transcripts; National Archives (TNA) PROB 11/418/381, will.
23. NULMss, Family information accompanies the catalogue to the Drury-Lowe papers.
24. Henry was the eldest son of Sir William Cavendish and his redoubtable wife Elizabeth, later known as Bess of Hardwick: <http://www.historyofparliamentonline.org/volume/1558-1603/member/cavendish-henry-1550-1616>. Henry's brother William was the ancestor of the Dukes of Devonshire.
25. Douglas Richardson, *Magna Carta Ancestry*, 2005, pp57-59, accessed via Google Books.
26. TNA, PROB 11/418/381.
27. TNA, PROB 11/384 1686, section 58.
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29. Robert Thoroton, *History and Antiquities of Nottingham*, ed. John Throsby, 1790, Vol 2, section 4, *British History Online*: <http://www.british-history.ac.uk/thoroton-notts/vol2/pp73-112>.
30. Lucy Hutchinson, ed. Jane Sutherland, *Memoirs of the Life of Colonel Hutchinson with the fragment of an autobiography of Mrs Hutchinson*, 1973.
31. Geoffrey F. Nuttall, Roger Thomas, R.D. Whitehorn and H. Lismar Short, *The Beginnings of Nonconformity (The Hibbert Lectures)*. 1964, online at www.unitarian.org.uk. Chap. 1, 'The Emergence of Nonconformity' by Geoffrey Nuttall.
32. *Ibid.*, p20.
33. See <http://www.historyofparliamentonline.org/volume/1604-1629/member/greaves-robert-1585-1663>
34. *Records of the Borough of Nottingham, being a series of extracts from the Archives of the Corporation of Nottingham*, 1900[-?], Vol 5, pp 226-7; his election is on p224.
35. His election is noted in Chancery records, 21 Chas I [1645-46], Mich. He would have been appointed to this role by the Mayor of Nottingham. Each city had two merchants so appointed. See <https://www.nottingham.ac.uk/manuscriptsandspecialcollections/researchguidance/deedsindepth/associated/statute.aspx> (accessed 5 September 2017)
36. *Records of the Borough of Nottingham*, Vol. 5, p257.
37. *Ibid.*, pp 251 and 278.
38. TNA, PROB 11/239, section 349, for will.
39. Information from Bestwick (see page 75); said to be an Admon 1686.
40. For his will see the *Correspondence of John Flamsteed*, Vol 2 (Appendix document 12).
41. *Correspondence of John Flamsteed*, Vol 1, p301 (Letter 188, 20 June 1674).
42. *Ibid.*, p307 (Letter 191, 10 October 1674).
43. *Ibid.*, p309 (Letter 192, 13 October 1674).
44. *Ibid.*
45. *Ibid.*, p312 (Letter 194, 17 October 1674).
46. A copy of the piece survives amongst Towneley papers at the Bodleian Library: MS Eng.e.3391.
47. CambUL, RGO 1/33, amongst Flamsteed's papers.
48. R. Slack, 'Trouble and Strife: The Wirksworth Lead Industry in the mid-17th. Century', *Bulletin of the Peak District Mines Historical Society* Vol 12, No 2. Winter 1993, pp 38-47 provides a useful summary, with a sketch-map showing soughs at p39. See <http://www.pdmhs.com/docs/default-source/bulletins/bulletin-12-2/bulletin-12-2---trouble-and-strife---the-wirksworth-lead-in.pdf?sfvrsn=4>,
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51. John A. Robey and Lindsey Porter, *The copper and lead mines of Ecton Hill, Staffordshire*, 1972.
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53. *Ibid.*, Letter 106, 6 June 1672.
54. Royal Society Library, LBO ix, pp 40-41, reproduced in the *Correspondence of John Flamsteed*, Vol 2, p131: Letter 504.
55. *Ibid.*, p358: Letter 588, 13 July 1687.
56. *Ibid.*, p383: Letter 597, 16 June 1688 (John Flamsteed to William Molyneux).
57. *Ibid.*, pp 389-91: Letter 606.
58. *Ibid.*, p392: Letter 607, 1688 [probably after 6 December].
59. *Ibid.*, p675: Letter 745, 3 May 1698.

60. *Ibid*, pp 690-693: Letter 757, 26 July 1698. The surviving copy is in the hand of a not very competent scribe, presumably one of Flamsteed's young amanuenses.
61. *Ibid*, pp 696-97: Letter 762, 29 September 1698.
62. CambUL, RGO 1/16, fol 185v. Robert 'Imings' turns up in various spellings: more usually Hem(m)ing.
63. DRO, D1145 A/PF 78/1 and 78/2. He is described as a maltster in deeds relating to a charitable trust: The first is dated 1 May 1648 and is recited in the second, 20 April 1687.
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66. Basic family tree at http://freepages.genealogy.rootsweb.ancestry.com/~jonessadler/index_files/Page1695.htm. (accessed 5 September 2017)
67. See ref 28.
68. William Dugdale, *The Visitation of Derbyshire, taken in 1662 and reviewed in 1663*, 1879, p32. 'Erminoio on a fess Gules between two bars gemel, three griffins' heads erased Or', with a crest of 'a griffin's head out of a mural crown'. It appears with the briefest of family trees, consisting only of John Spateman and his son John.
69. John T. Godfrey, ed., *Manuscripts relating to the county of Nottingham in the possession of Mr. James Ward*, 1900, item 6, accessed via https://archive.org/stream/manuscriptsrela00wardgoog/manuscriptsrela00wardgoog_djvu.txt.
70. This will is also held at The National Archives, because of its date.
71. George Wigglesworth, 'The Mills on Lea Brook, Derbyshire', *Wind and Water Mills*, No 25, Apr. 2006, p8; http://www.wigglesworth.me.uk/local_history/pdf/Mills.PDF.
72. Canon Prior, 'The Spatemans of Roadnook', *DAJ*, Vol 37, 1915, pp 43-54.
73. LJRO, B/C/11.
74. See ref 62 above.
75. There is an odd illegible note about her in the 1660s St Werburgh parish register - which cannot refer to either a christening or a burial. A probate document from 1676 makes provision for a legacy due to her from her grandfather.
76. Quoted by Baily from the early part of Cambridge University Library MS, RGO 1/17. Baily, p25.
77. DRO, D1428 A/P1 1/1 BMB 1577-1724 (Microfilm M291 vol. 1).
78. Rev. C. Kerry, 'Miscellanea', *DAJ*, Vol 9, 1897, p109.
79. Mark Fryar, *Some Chapters in the History of Denby*, 1934, reprinted 1994, pp 79-80.
80. W.P.W. Phillimore, *Derbyshire. Parish Registers: Marriages*, Vol 13, p122 (24 Nov. 1645).
81. Harleian Society New Series 8, 1989.
82. TNA, PROB 11/201, proved on 6 September 1647.
83. Now in the Whipple Library, Dept of History and Philosophy of Science, Cambridge, ref. Store 75:10.
84. LJRO, Edward Potterell's will, made 27 April 1667 and proved 18 January 1668 (accessed through www.findmypast.co.uk.)
85. Leicestershire Record Office, Oakham parish register transcripts DE2694/1.
86. TNA, PROB 11/223 (192 Bowyer).
87. *Correspondence of John Flamsteed*, Vol 2, pp 774-76: Letter 787. Both the Richards are listed in Henry R. Plomer, *A dictionary of the printers and booksellers who were at work in England, Scotland and Ireland from 1668 to 1725*, 1922, reprint 1968; with the respective dates of flourishing 1669-1703 and 1698-1703. In 1703 they were succeeded by John's wife Hannah. John was baptised at St Peter's Nottingham on 7 Sept. 1675 (*JGI*, Nottinghamshire, 1992, p15, 405) and obtained a licence to marry Hannah Moore in 1699: *Nottinghamshire Marriage Licences*, p499.
88. TNA, PROB 8/88 f. 111r, will.
89. At least, none appears in the published volumes of Oldenburg's *Correspondence*, and the only references to Wilson's name in the indexes to those volumes occur when he is mentioned in letters written by Flamsteed.
90. LJRO, B/C/11, accessed through www.findmypast.co.uk. See also his father's will, made in 1658 and proved in 1661, which shows land being divided between several brothers.
91. Cassandra, Duchess of Chandos, ed. by A.C. Wood, *The Continuation of the History of The Willoughby Family*, 1958, pp 52-55.
92. *Ibid*, p52.
93. Frank Nixon, *The Industrial Archaeology of Derbyshire*, 1969, p73.
94. *Ibid*, p53, note 1.
95. *Ibid*, p53.

96. *Ibid*, p54.
97. See ref 17 above and www.nottingham.ac.uk/manuscriptsandspecialcollections/collectionsindepth/family/middleton/biographies (accessed 5 September 2017)
98. The Shakespeare Birthplace Trust, Stratford upon Avon, DR3/405-418.
99. *Ibid*, DR 3/497.
100. TNA: C 6/279/43 and 44; C 6/285/118.
101. IDLHS, Newsletter, no 84, October 1976 (in a discussion of the parish records of West Hallam).
102. Nottinghamshire Archives, DD/CH/9/17-18. Anne Powtrel appointed a cleric to West Hallam in 1668.
103. TNA, PROB 11/384 1686 section 58.
104. Maxwell Craven, *John Whitehurst of Derby: clockmaker and scientist, 1713-88*, 1996; Revised 2016 as *John Whitehurst: innovator, scientist, geologist and clockmaker*. Maxwell Craven, *Derby: An Illustrated History*, 1988; reprint 1990, p68. The premises were much altered by later occupants, including the Smiths, clockmakers, whose name still stands over the door. See Maxwell Craven, *The Smiths of Derby, A Journey through Time*, 2012, pp 32-37.
105. Brief details appear in: <http://www.derby.gov.uk/media/derbycitycouncil/contentassets/documents/conservationareas/DerbyCityCouncil-Derby-Locally-Listed-Buildings-March-2011.pdf>.
106. *The Derby Telegraph*, www.derbytelegraph.co.uk: eg 25 January.2014 and 2 July 2014.
107. <http://derbyblueplaques.co.uk/john-flamsteed/>.
108. Baily (ref 3 above), p10.
109. Maxwell Craven, *Derby: An Illustrated History*, p56. A later sketch of the old school building in St Peter's churchyard shows it as an unpretentious structure with three mullioned windows on the ground floor and two gables in its tiled roof.
110. B. Tachella, *Derby School Register, 1570-1901*, 1902, p4.
111. J. and J.A. Venn, Alumni Cantabrigienses. <http://venn.lib.cam.ac.uk/Documents/acad/2016/search-2016.html>. (Accessed through ACAD web site 5 September 2017.)
112. *Ibid*.
113. Examining the originals of such letters (reproduced in the first volume of Flamsteed's *Correspondence*) reveals much evidence of intervention and some wholesale rewriting undertaken by Henry Oldenburg, the Society's Secretary.
114. Baily, p8.
115. Baily, p9.
116. *Correspondence of John Flamsteed*, Vol 1, p245: Letter 160, 24 August 1673.
117. Baily, pp 9-10.
118. Baily, p10
119. LJRO, B/C/11, will.
120. Thomas Stirrup and William Leybourne, *Horometria: or, The compleat diallist*. 'Wherein the whole mystery of the art of dialling is plainly taught three several wayes; two of which are performed geometrically by rule and compass onely: and the third instrumentally, by a quadrant fitted for that purpose. With the working of such propositions of the sphere, as are most usefull in astronomy and navigation, both geometrically and instrumentally' by Thomas Stirrup, philomath. 'Whereunto is added an Appendix, shewing how the parallels of declination; the Jewish, Babylonish, & Italian hours; the Azimuths, Almicanter &c. may be easily inscribed on any dial whatsoever, by rule and compass onely. And to draw a dial on the seeling of a room' by W. Leybourn. The second edition with additions (London: printed by R. & W. Leybourn, for Thomas Pirrepoint, 1659).
121. Edmund Gunter's *Canon Triangularum*, 1620, and *The Description and Use of the Sector, Crosse-Staffe and other Instruments*, 1624, were republished together in numerous later editions.
122. Presumably *Trigonometrie, or, The manner of calculating the sides and angles of triangles by the mathematical canon demonstrated*, by William Oughtred, London, 1657.
123. Baily, p11.
124. Baily, p11.
125. Joseph Hunter, *Familiae Minorum Gentium*, 1895, Vol 3, p838.
126. J. P. Yeatman, *The Feudal History of the County of Derby*, 1886-1912, Vol 3, section V, pp 22-25.
127. DRO, D187/2/112, Described as woollen-drapery in a 1673 deed.
128. Robert Simpson, *A collection of fragments illustrative of the history and antiquities of Derby*, 1826, Vol 2, pp 799-801, will dated 22 September 1703.
129. On the Mercer's Company see Maxwell Craven, *Derby: An Illustrated History*, p64. A list of the churchwardens of the parish of St Michael from 1665 onwards appears in Robert Simpson, *Derby*, 1826, pp 398-403.
130. NULMss, AM/MB 77/110.

131. Stephen Glover, *The History and Gazetteer of the County of Derby* (1829-1833), p234; parish register of St Michael's, Derby, DRO, D3049 A/PI 1/1 for his burial on 29 August 1671. Robert a son of John Litchford was baptised in the same parish on 10 October 1633.
132. *Oxford Dictionary of National Biography* (ODNB)
133. Baily, p22. Flamsteed went on to write a piece attacking the pretensions of '*judicial astrology*'; this and his rather ambivalent attitudes to the topic in later life are examined by Michael Hunter in 'Science and astrology in seventeenth-century England: an unpublished polemic by John Flamsteed', in Patrick Curry, ed., *Astrology, Science and Society: Historical Essays*, 1987, pp 260-86.
134. Baily, p13.
135. Baily, p20.
136. *Correspondence of John Flamsteed*, Vol 1, p48 (Letter 19).
137. Anita McConnell, 'Halton, Immanuel (1628-1699)', ODNB, 2004, <http://www.oxforddnb.com/view/article/12031>. Patricia M. Barber, 'Immanuel Halton, the astronomer', *Journal of the British Astronomical Association*, Vol 106, No 1, pp 22-28. <http://adsabs.harvard.edu/full/1996JBAA..106...22B>
138. Its history and Halton's contribution to the building are described in Maxwell Craven and Michael Stanley, *The Derbyshire Country House*, new edn, 2001, Vol 2, pp 241-44. It is now in the custody of English Heritage. <http://www.english-heritage.org.uk/visit/places/wingfield-manor/>.
139. *Correspondence of John Flamsteed*, Vol 1, p924; Baily, p21.
140. P. M. Barber article, see ref 127 above.
141. Baily, p21.
142. *Ibid.*
143. Baily, p23.
144. *Correspondence of John Flamsteed*, Vol 1, extra note added in proof on p28.
145. Baily, p11. The reluctance to fund a clock is understandable: while monetary comparisons cannot be made with any great precision, in modern terms it would be equivalent to spending several thousand pounds.
146. Lynn Beats, 'Politics and Government in Derbyshire, 1640-1660' unpublished Ph.D. dissertation, University of Sheffield, 1978, provides a thorough analysis of the results of the war and interregnum. A. M. Morton Thorpe, 'The gentry of Derbyshire, 1640-1660', M.A. dissertation, University of Leicester, 1971, gives a briefer account and places more emphasis upon the predominant social stability.
147. M. Arnold-Bemrose, 'The Derby Company of Mercers', *DAJ*, Vol 15, pp 113-60.
148. Cited by A. M. Morton-Thorpe (ref.146), p11.
149. Frank Nixon, *The Industrial Archaeology of Derbyshire*, 1969, pp 31, 34, 40, 42; Flemings at p50.
150. For Moore's early life see my *Sir Jonas Moore: Practical Mathematics and Restoration Science*, 1993, Chap. 1. Flamsteed in early adulthood also identified strongly with the group of '*northern astronomers*'; who were linked to each other through the Towneleys. See my 'Models for the practice of astronomy: Flamsteed, Horrocks and Tycho', in Frances Willmoth, ed., *Flamsteed's Stars: New Perspectives on the Life and Work of the First Astronomer Royal (1646-1719)*, 1997, pp 49-75.
151. *Correspondence of John Flamsteed*, Vol 1, pp 302-07 (Letter 189, 30 June 1674).

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