

RICHARD TOWNELEY (1629-1707), THE TOWNELEY GROUP AND SEVENTEENTH- CENTURY SCIENCE

BY C. WEBSTER, M.SC.

Read 8 December 1966

THE science of the seventeenth century is known mainly through the study of the writings of such familiar figures as Newton, Boyle and Harvey. Their contributions were great and their fame is well justified, but with detailed study it becomes apparent that they benefited greatly through their contacts with certain less eminent natural philosophers. Since such figures provided an important element in the scientific environment of this period, it is only when their works are fully evaluated that a balanced view of seventeenth-century science will be obtained. The fact that so many of these less familiar contributors did not publish their works has been a common cause of their failure to attract attention from modern historians of science. Consequently, the eventual examination of the manuscripts of such scholars as Thomas Harriot the mathematician, William Gascoigne the astronomer and Sir Thomas Browne the naturalist, has introduced a new perspective in our study of the seventeenth-century scientific revolution.

Richard Towneley, like these others, made a significant contribution to the science of the seventeenth century; his scientific interests were extensive and he is known particularly for his contributions to the discovery of 'Boyle's Law', for the improvement and popularisation of the micrometer, and for his meteorological measurements.⁽¹⁾ Nevertheless, his activities were wider than is generally realised, as is shown by the few manuscripts of his which the present author has been able to trace. Other of his manuscripts probably remain unidentified after the dispersal of the Towneley Library.⁽²⁾ It is the purpose of the present

⁽¹⁾ A. Wolf, *History of Science and Technology in the Sixteenth and Seventeenth Centuries*, 2nd ed. (1962), pp. 168-78, 235, 239, 241, 243, 310.

⁽²⁾ J. Towneley, *Bibliotheca Townelsiana*, 2 pts. (1814-15). *Catalogue of the Towneley library, sold 18th June, 1883*, Sotheby, Wilkinson and Hodge (1883). *Catalogue of the Towneley Manuscripts, sold 27th June, 1883*, Sotheby, Wilkinson and Hodge (1883). The manuscripts were sold for £4,054. The published catalogues give only an incomplete idea of the contents of Richard Towneley's library.

article to outline the extent of his scientific interests and to give some account of his life and associates. This latter aspect of the investigation is significant for two reasons. Firstly, the biographical materials relating to him are so scattered and conflicting that most authorities have assumed that no reliable account could be produced. Therefore there has been a tendency to confuse Richard Towneley with his uncle Christopher Towneley, the antiquary. Secondly, as the history of the Towneley family is unfolded, it will become apparent that they were at the centre of a flourishing scientific movement in the north of England. This movement paralleled developments at the universities of Oxford and Cambridge and in London during the Civil War period. English natural philosophers realised the great advantages of the co-operative approach to scientific problems and organized themselves into small informal "clubs". Ultimately these various groups coalesced with the foundation of the Royal Society in 1662.

Richard Towneley and his friends are interesting because of their relative isolation from the Royal Society. In this article it will become apparent that this isolation was not accidental. It was immediately the result of geographical isolation, but this factor was reinforced by the peculiar religious circumstances of the Towneley family and their friends. They represented the Catholic gentry, a group whose fortunes were held in delicate balance in the unstable political atmosphere of the seventeenth century. There was constant fear of religious persecution and Richard Towneley was head of his family during one of the most critical periods for this Catholic minority.

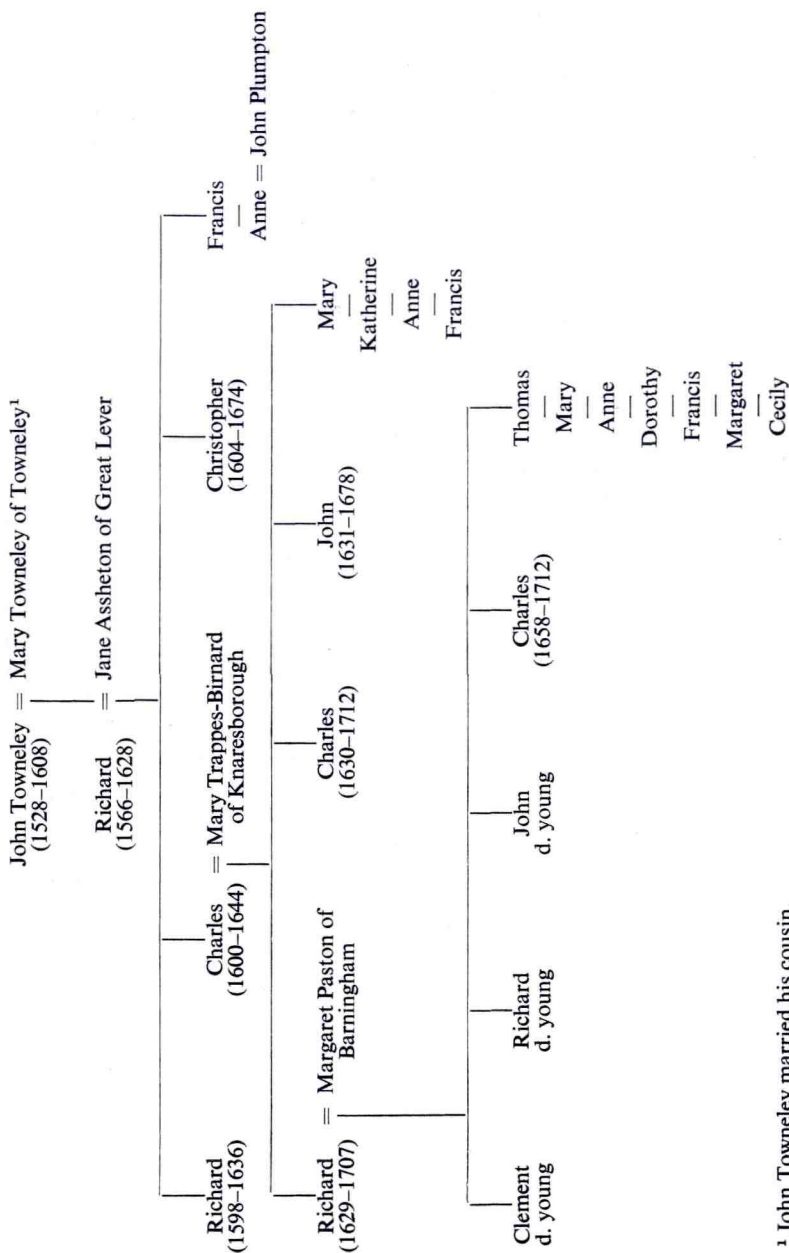
I THE TOWNELEY FAMILY

One, and possibly the main, cause of Richard Towneley's isolation is to be found in the turbulent history of the Towneley family during the seventeenth century. They inherited their Elizabethan ancestor's implacable determination to resist the Protestant reformation. Thus, as head of his family during a large part of the century, Richard Towneley was destined to endure the distrust and financial penalties of a succession of governments. Like others in his position, he responded by withdrawal from public life, while, in association with other Catholic families of similar social status, he conspired to

His library catalogue, compiled in about 1700, is preserved in the John Ryland's Library (R.72649). It contains a rich collection of scientific and mathematical works, as well as 16 volumes of Christopher Towneley's manuscripts and a manuscript *Logic* by Richard Towneley.

THE GENERATIONS OF THE TOWNELEY FAMILY MENTIONED IN THE TEXT

The dates of birth and death of the more important figures are given.



¹ John Towneley married his cousin.

preserve his religious integrity and evade the punitive legislation of the times.

The Towneley family had been associated with Towneley, near Burnley, since the beginning of the thirteenth century and were descended from Geoffrey, Dean of Whalley. They retained close association with the affairs of Whalley Abbey until the sixteenth-century dissolution of the monasteries. By then, they had obtained considerable estates in the district around Burnley in Lancashire, in Lincolnshire and in Nottinghamshire, establishing Towneley Hall and Nocton Abbey as their main residences.⁽³⁾

John Towneley (1528–1608) inherited the family estates during the reign of Mary, when he became a J.P. However, after only four years Elizabeth acceded to the throne. In the early years of her reign the movement against the Catholics was scarcely perceptible in Lancashire, due to the reticence of Bishop Downham and the Earl of Derby. During this period the rural areas of north and west Lancashire became the stronghold of English Catholicism, and it was not until 1581 that the Catholic families were disturbed by harsher penal legislation.⁽⁴⁾ As one of the leaders of the Catholic movement, John Towneley was treated with both gentle admonition and brutal imprisonment.⁽⁵⁾ His punishments were partially alleviated through the mediation of his near relation, Alexander Nowell, the respected Dean of St. Paul's, who had considerable influence with Leicester and Elizabeth. Not only were the anti-Catholic measures ineffective, but there is even evidence that the Catholics consolidated their position. In 1590, the Puritan clergy lamented "the continual recourse of Jesuits and Seminarie Priests into

⁽³⁾ *Victoria County History, Lancashire*, Vol. 6 (1911), pp. 457–9. The history of the Towneley family in the thirteenth and fourteenth centuries is relatively obscure. Hunting rights were granted to *Geoffrey*, son of the Dean of Whalley c. 1200. His grandson, Richard de Towneley, left 3 co-heiresses; each receiving a third of the Towneley estate. (1) *Agnes*, m. (a) John de Catteral, (b) Robert de Broughton; (2) *Isabel*, m. Philip de Clayton; (3) *Cecily*, m. John de la Legh of Hapton. Cecily's younger son, *Richard*, took the name de Towneley; he leased Agnes's share of the estate. His son, *John de Towneley*, was at first part owner, and by 1382 whole owner of this share. John de Towneley came to own the whole estate with the death of his uncle, Gilbert de la Legh, Cecily's eldest son, who had received his mother's portion and bought that of Isabel.

See note by Col. J. Parker, *Lancs. and Ches. Ant. Soc. T.*, Vol. 27 (1909), pp. 148–9. The author expresses thanks to Mrs. Mary Brigg for her notes on this and other subjects connected with this article.

⁽⁴⁾ W. R. Trimble, *The Catholic Laity in Elizabethan England, 1558–1603* (1962), pp. 164–76, and J. S. Leatherbarrow, "The Lancashire Elizabethan Recusants", in *Chetham Soc.*, N.S., Vol. 110 (1947).

⁽⁵⁾ W. R. Trimble, *op.cit.*, pp. 75–6, 106, 169, 213–15. P. Tyler, *The Ecclesiastical Commission and Catholicism in the North, 1562–1577* (1960), pp. 99–100, 114–17.

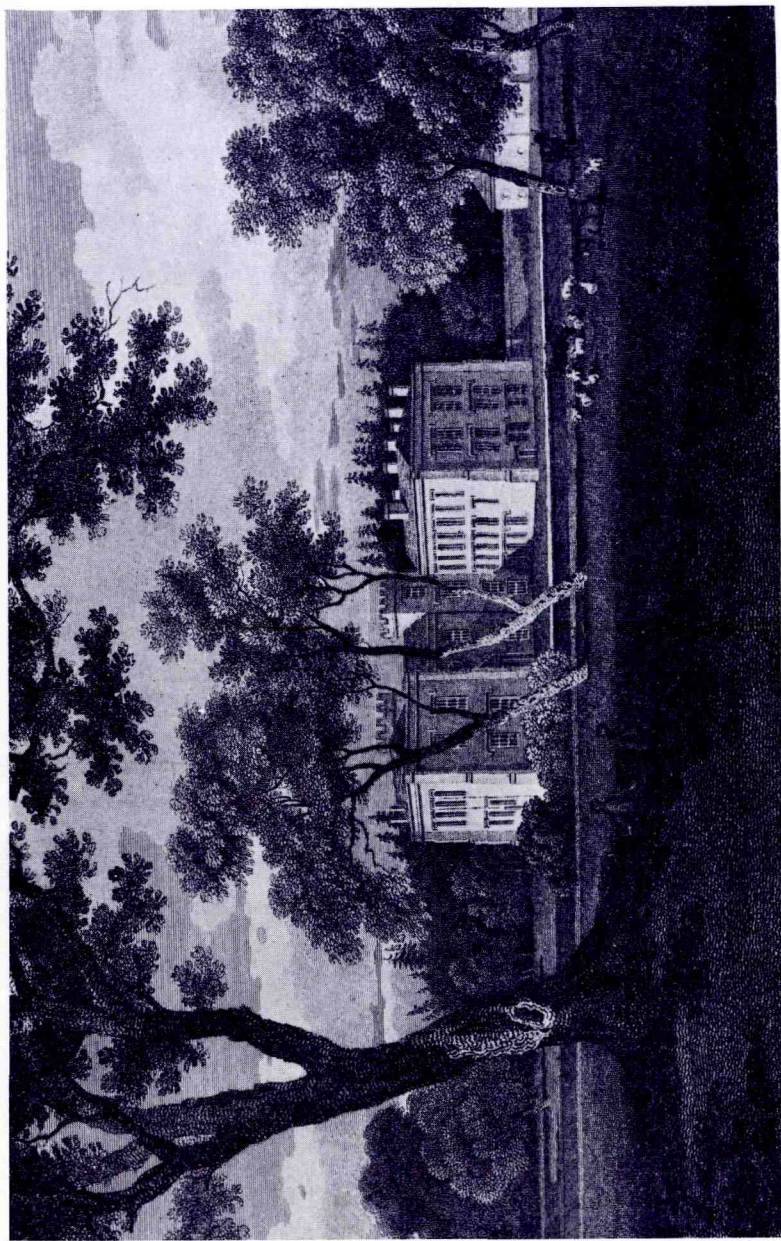


Plate 7.

TOWNELEY HALL FROM THE NORTH-EAST

An engraving by James Basire, based on a drawing by J. M. W. Turner, 1799. (From T. D. Whitaker, *The History of the Original Parish of Whalley*, third edition (1818), p. 341)

these parts"; masses, baptisms and marriages took place in private houses (*Chetham Miscellany*, V, pp. 1-2). John Towneley sheltered the ejected priests James Hargreaves of Blackburn and Henry Crane of Padiham. He also possessed an ingenious folding altar, which was hidden at his land agent's house.

In addition to imprisonment and house arrest, financial measures against the Catholics were introduced. John Towneley's declared income in 1586 was £500; he was liable to pay a fine of £240 for that year! Although such fines could not be rigorously implemented, they were sufficient to ruin many poorer families. However, the Towneley wealth and ingenuity were sufficient to make such impositions tolerable.

John Towneley was succeeded by his son, Richard Towneley (1566-1628), grandfather of the natural philosopher, whose judicious settlement of his estates and careful exploitation of the mineral wealth of his lands enabled him to increase his income to about £1,700 per annum,⁽⁶⁾ and withstand the recusancy fines, such as the £213 which was owed in 1632.⁽⁷⁾ It is in Richard's children that the inclination towards humanistic learning is found. The second son, Charles (1600-44), was educated at St. Omers in the Low Countries,⁽⁸⁾ Louvain and Rome; the third son, Christopher (1604-74), became an attorney and a devoted patron of learning.⁽⁹⁾ Charles, and his sister Anne, married members of prominent Yorkshire Catholic families.⁽¹⁰⁾

⁽⁶⁾ *Responsa Scholarum* of the English College, Rome, Catholic Record Society, Vol. 54 (1962), pp. 339-40.

Iron ore was mined and smelted at Cliviger as early as the thirteenth century. During the sixteenth century, the Towneleys exploited the coal resources at Burnley and Cliviger. The copyholders in these areas contested the Towneley's mining rights. During the seventeenth century they mined coal at Burnley, Cliviger, Great Marsden and Colne. *V.C.H. Lancs.*, Vol. 2, p. 287. *Lancs. & Ches. Ant. Soc. T.*, Vol. 59 (1949), p. 4.

Richard Towneley (d. 1636) became involved in attempts to exploit the Thieveley Pike lead deposits. This venture was a failure; *The Thieveley Lead Mines 1629-1635*, ed. R. Sharpe France, Lancs. and Ches. Rec. Soc., Vol. 102 (1947).

⁽⁷⁾ J. Brownbill, "Lancashire Recusants about 1630", in *TRANSACTIONS*, Vol. 60 (1908), pp. 171-180, 177.

⁽⁸⁾ *Responsa Scholarum* of the English College, Rome, Catholic Record Society, Vol. 54 (1962), pp. 339-40.

⁽⁹⁾ T. D. Whitaker, *History of . . . Whalley*, 3rd ed. (1818), p. 488; *D.N.B.*

⁽¹⁰⁾ Charles Towneley married Mary, a younger daughter of Sir Francis Trappes-Birnard of Knaresborough, in November 1628; T. D. Whitaker, *Life and Correspondence of Sir George Radcliffe* (1810), pp. 132, 165, 170. Anne Towneley married John Plumpton (1604/5-1644), son of Sir Edward Plumpton of Spofforth, in December 1627. She died in March 1643/4 and he died as a result of wounds from the battle of Marston Moor, July 1644. Sir Edward Plumpton transcribed the well-known *Plumpton Correspondence*. This manuscript passed to Christopher Towneley in about 1650 and it was edited by Thomas Stapleton, *Camden Soc.*, Vol. 4 (1838/9).



Plate 8.

JOHN TOWNELEY, 1528-1608

An engraving based on a portrait at Towneley Hall (Whitaker, *op. cit.*,
p. 488)

This tendency to take advantage of the English Catholic colleges on the continent was continued later by generations of the Towneley family, Yorkshire and Lancashire Catholics being prominent at these colleges. Indeed, the establishments had been initiated during Elizabeth's reign by the Lancashire Catholic, Cardinal William Allen. The students from the colleges at Rome, Louvain, Douai and St. Omers had the advantage of an academic education which was comparable to, and possibly more rigorous than, that at the English universities. In addition, this continental education introduced the more ambitious scholars to the varied controversies which enlivened the intellectual life of France, Italy and the Low Countries during the first half of the seventeenth century.

The Towneley estates passed to Charles Towneley on the death of his elder brother, Richard, in 1636. Charles was probably absorbed in the management of his extensive estates, while his younger brother, Christopher, settled first at Carr Hall and later at Moor Isles, in the Pendle Forest region.⁽¹¹⁾

Like the Towneleys of Towneley, Christopher built up a library and devoted his life to the transcription and collection of historical documents. Revival of interest in historical research was symptomatic of the general intellectual renaissance in seventeenth-century England, when an interest in historical research was shared by many natural philosophers, from Raleigh, at the beginning of the century to Elias Ashmole, Christopher Towneley's contemporary. Even more than the new scientific movement, the interest in historical documents captured the imagination of many northern authors. Christopher Towneley was aided by Dr. Kuerden in assembling documents for a history of Lancashire, while in Yorkshire Christopher Towneley had access to the historical collections of Sir John and Richard Gascoigne and Roger Dodsworth.⁽¹²⁾ Christopher Towneley's interests extended to natural philosophy, and he was acquainted with the young Lancashire astronomers, Jeremiah Horrocks and William Crabtree as well as the Yorkshire astronomer, William Gascoigne. After the premature death of these import-

⁽¹¹⁾ Mary Brigg, "The Forest of Pendle in the Seventeenth Century", in *TRANSACTIONS*, Vol. 113 (1961), pp. 65-90. A portrait of Christopher Towneley is given on p. 75 of *TRANSACTIONS*, Vol. 115 (1963).

⁽¹²⁾ Richard Gascoigne (1579-1661) of Bramham Biggin, Yorks., and his cousin, Sir John Gascoigne (1556/7-1637) of Barnbow, Yorks., collected extensive manuscripts relating to their family: F. S. Colman, *History of Barwick-in-Elmet*, Thoresby Society, Vol. 17 (1908), pp. 148-150, 172. Both were related to the astronomer, William Gascoigne: N. Denholm-Young and H. H. E. Craster, "Roger Dodsworth and his Circle", in *Yorkshire Archaeological Journal*, Vol. 32 (1935), pp. 5-32.

ant figures,⁽¹³⁾ many of their papers were collected by Christopher Towneley, who preserved them until they became the source of stimulation to the next generation of astronomers.

While it is not the purpose of this article to provide a detailed analysis of the contributions of Christopher Towneley's collaborators to astronomy, it should be emphasized that their achievements are comparable with those of the leading practical astronomers of the century. Indeed, their works seem even more remarkable if the circumstances in which they were produced are remembered. They were the result of a period of intense activity by these young enthusiasts, whose observations were made over the extremely short period between 1636 and 1642. The most prominent figure, Horrocks, was about eighteen at the outset of the studies; Gascoigne and Crabtree were in their twenties.

A significant part of their achievement was their attention to systematic astronomical observation, a discipline which must have been largely self-taught. Indeed, there had been a gifted group of astronomers in the circle which centred around Thomas Harriot. They pioneered the use of the telescope in England at the very time when Galileo was writing the *Siderius Nuncius* (1609–10). It was left for Horrocks to recognise the significance of the systematic methods of Tycho Brahé and Kepler. He alone of his group attended a university, but even there, the mathematical and physical sciences were taught in a most rudimentary manner, although it is just possible that he may have been influenced by that exceptional mathematics teacher, William Oughtred.

Horrocks, upon his return to Lancashire in 1636, introduced Keplerian astronomy to William Crabtree. Both were men of limited means and astronomy was the absorbing activity of their leisure hours. Crabtree undertook a revision of Kepler's *Rudolphine* tables, while Horrocks occupied himself with major problems connected with planetary theory, his most famous studies being on the theory of the moon's motions and the observation of the transit of Venus, in December 1639.

It was probably through Christopher Towneley that Crabtree and Horrocks became associated with Jonas Moore, Jeremiah Shakerley and William Gascoigne, the last being the most significant figure. He too had failed in his quest for an education which would introduce him to the rudiments of mathematics and astronomy; like Horrocks, Wallis and many others, he probably taught himself these subjects using Oughtred's *Clavis*

⁽¹³⁾ Horrocks died in 1641 at the age of 22; Crabtree in 1644 at the age of 34; and Gascoigne in 1645 at an age probably below 30.

mathematicae. His particular genius was in the direction of invention, rather than astronomical observation, and he created the instruments which were essential for improving the accuracy of astronomical observation. As Horrocks pioneered the use of the *Rudolphine* tables, so Gascoigne, independently, introduced the Keplerian telescope. This was an essential prerequisite for the inclusion of his newly-invented measuring instruments in the structure of telescopes. Gascoigne's most important invention, the micrometer, was improved by Richard Towneley, who communicated it to the Royal Society in 1666. In making this instrument, he had the assistance of a local watchmaker, and this confirms the view that a flourishing watchmaking industry emerged in South Lancashire during the second half of the seventeenth century.

Christopher Towneley was responsible for exchanging letters between the Yorkshire and Lancashire astronomers. This activity was presumably incidental to his main interest in collecting historical materials in Lancashire and Yorkshire. However, he was one of the few scholars to have been intimately acquainted with all three astronomers, and he became the major source of biographical information about them. Sir Edward Sherburne probably received his information about them from Christopher Towneley, whom he included in his catalogue of astronomers:

"These Four, [Horrocks, Crabtree, Gascoigne, Moore] were Lights of the first Magnitude in the northern Hemisphere who were happily brought to the Acquaintance of one author by means of Christopher Towneley of Carr in Lancashire Esquire, who stuck not for any cost or labour to promote as well Astronomical as other Mathematical studies by a diligent Correspondence kept and maintained with the learned Professors in those Sciences; upon which Account he was very dear to All the Four, and for which reason, as for the particular respect I owe him, he merits to be named in this Catalogue."⁽¹⁴⁾

Of these astronomers, only Jonas Moore (1627–79) survived the civil war, and it is possible that he received his introduction to mathematics and astronomy through Christopher Towneley. He was a native of White Lee in Pendle Forest, and was possibly the son of the farmer, John Moore.⁽¹⁵⁾ Moore, as a young man, became a clerk in Durham, where he was further assisted in his astronomical studies by William Milbourne, vicar of Brancepeth. He was patronised by Charles I during the civil war; through his military service, he became acquainted with Gascoigne and Shakerley when he revisited Christopher Towneley.

Jeremiah Shakerley⁽¹⁶⁾ was probably a native of Carr or

⁽¹⁴⁾ Sir Edward Sherburne, *The Sphere of Marcus Manilius* (1675), pp. 92–3.

⁽¹⁵⁾ Mary Brigg, *op.cit.*, pp. 70, 82. See *D.N.B.* Jonas Moore was knighted during the Restoration.

⁽¹⁶⁾ See *D.N.B.*

Clitheroe, who came to the notice of Christopher Towneley, with whom he lived for a few years before 1651. He was introduced to Moore, and became the first to publish Horrocks's astronomical observations and an account of Crabtree's mathematical methods in his *Tabulae Britannicae* of 1653. Horrocks's and Crabtree's manuscripts had probably been obtained from Christopher Towneley; they were ill-fated since they were partially destroyed by fire before they could be incorporated in the collected edition of Horrocks's works in 1673.

II THE CIVIL WAR

1642 saw the climax of the struggle for power between Charles and Parliament, with the concomitant emergence of their rival armies. This development had a disastrous influence on the Towneley family and the scientific activities of the group who were associated with Christopher Towneley.

The English Catholics were almost unanimous in their support for the king, who, like James I, had treated them with some leniency. Equally, they were convinced that a Parliamentary victory would lead to greater intolerance. In 1642, Charles Towneley, together with five other leading Lancashire Catholics, petitioned Charles to be allowed to form defensive armed bands. He was reluctant to grant their request, since alignment with the Catholics entailed certain political disadvantages. Soon, however, Charles Towneley had become a colonel in one of the Lancashire regiments. Other prominent Catholic gentry reacted similarly, and we find the Gascoignes of Barnbow and Sherburnes of Stonyhurst also actively supporting the king. Christopher Towneley, William Gascoigne, Jonas Moore and Edward Sherburne became officers in the royal army. Scientific studies were thus interrupted and the first phase of the Towneley group's activities was ended.

Charles Towneley and the Lancashire army were most unsuccessful. Since the populations of Burnley, Blackburn, Clitheroe and Colne were hostile to the king, it is not surprising that Towneley Hall fell to the Parliamentarians from Manchester at the inception of the war. After the fall of Preston in 1643, Charles and Christopher Towneley joined Prince Rupert's army, which crossed the Pennines to Yorkshire. Charles was killed at the battle of Marston Moor in 1644, and Christopher was captured and imprisoned. William Gascoigne was a captain in Sir Marmaduke Langdale's cavalry regiment; he survived Marston Moor, to be killed in a skirmish at Melton Mowbray

in 1645.⁽¹⁷⁾ Moore and Sherburne survived the war, probably leaving the king's service soon after the siege of Oxford in 1646. Since both had sacrificed their posts at the beginning of the war, it was only with difficulty that they became rehabilitated in the Commonwealth society, when they sought employment in London. Shakerley was equally ill-fated; he left England on a voyage to India in 1653 and probably died shortly after arriving there. Thus, at the end of the civil war, only Christopher Towneley remained in Lancashire and the most important members of the Towneley group were dead. They had produced no publication of importance and their manuscripts were only incompletely preserved.⁽¹⁸⁾

III RICHARD TOWNELEY, THE NATURAL PHILOSOPHER

Richard Towneley was born in 1629⁽¹⁹⁾ and was the eldest of Charles Towneley's seven children. In his scientific work he was assisted by his three younger brothers, but one, Charles, was particularly associated with this work, as well as managing the Towneley estates. During Richard's minority, the estates were entrusted to Christopher and Mary Towneley. Richard and his family remained faithful to the Stuarts, and consequently suffered various penalties during the Commonwealth. There is little evidence about Richard's education, but he was probably taught first by a private tutor in England and later at one of the continental Catholic colleges. Certainly this was the pattern for his younger brothers, Charles and John, who entered the

⁽¹⁷⁾ Gascoigne is generally thought to have been killed at Marston Moor in 1644. This is incorrect, since his death was described in various accounts of the battle at Melton Mowbray in February, 1645. The mistake appears to have been due to Richard and Charles Towneley, who informed Thoresby and Sherburne that Gascoigne was killed at Marston Moor.

⁽¹⁸⁾ Shakerley based his *Tabulae Britannicae* (1653) on the manuscripts of Crabtree and Horrocks. After his departure for India, his collection of manuscripts passed to the publisher, Leybourne, but some were shortly afterwards destroyed by fire. John Worthington, Master of Jesus College, Cambridge, assembled various of Crabtree's manuscripts, after the latter's death. It was the above manuscripts which formed the basis of Horrocks's *Opera posthuma*, ed. Wallis (1673). The influence of the Towneley collection of manuscripts was limited to the small sections of the above work contributed by Flamsteed. The first work of Horrocks to be published was his *Venus in sole visa*, ed. J. Hevelius (1662). Jonas Moore registered an *Arithmetic* in 1647. It was published in 1650.

⁽¹⁹⁾ Since Richard Towneley's father was not married until November 1628 (see note 10), it is improbable that Richard was born before the summer of 1629. This is in agreement with Whitaker, *op.cit.*, p. 488-9, which states that he was 77 at his death. The genealogists Dugdale and Foster suggest that he was born in 1627 or 1628; *Visitation of Lancashire, 1664/5*, Chetham Soc., Vol. 80 (1873), pp. 304-7; J. Foster, *Lancashire Pedigrees* (1873).

Douai College in 1649.⁽²⁰⁾ Richard Towneley's knowledge of French and Latin, as well as his great familiarity with the philosophies of Gassendi and Descartes, is consonant with his having received a continental education.

The civil war had been disastrous for the Towneley family, and one of the first problems to face Richard was the redemption of the estates, which had fallen into the hands of the Parliamentary sequestrators during the war. The yield of the estates was assessed at £1,000 per annum, which was probably well below their real value. When they were sold to a number of buyers between 1650 and 1651, only the manor of Hapton was allowed to Mary Towneley.⁽²¹⁾ It is probable that the family lived there until Towneley Hall was regained. In spite of the dispersal of the estate, by 1653 the Lancashire holdings had been regained, probably at the sacrifice of the Lincolnshire property.⁽²²⁾

In about 1653, Richard Towneley married Margaret Paston, daughter of Clement Paston of Barningham Hall in Norfolk.⁽²³⁾ This younger branch of the Paston family were Catholics, unlike the Pastons of Oxnead Hall. Sir Robert Paston, later first Earl of Yarmouth (a friend of Sir Thomas Browne and an enthusias-

⁽²⁰⁾ *Douai Diaries II, 1598-1654*, Catholic Rec. Soc. Vol. II (1911), p. 502.

⁽²¹⁾ *Calendar of the Committee for Compounding*, Vol. 3, pp. 2222-4; Vol. 5, pp. 3297-8. *Royalist Composition Papers, 1643-1660*, Lancs & Ches. Rec. Soc., Vol. 95 (1941), pp. 204-8.

⁽²²⁾ An accurate idea of Richard's income is to be obtained from the detailed description of the Towneley estate made in 1717. The Lancashire estate was at that time 2,406 acres; its farms carried an annual rental of £991. In addition, each tenant owed considerable liege service, as shown by the following typical entry: "Two farms, 14 ac. let by Richard and Charles Towneley to Thomas Sutcliffe, at £8.5s. rent, 1 day ploughing, 1 day harrowing, 1 day mowing, 5 days working at hay, 4 days reaping corn, and keeping a hound or spaniel, or 6 fat hens." *Registers of the Lancashire Papists 1717-88*, ed. R. Sharpe France, Lancs. and Ches. Rec. Soc. Vol. 108 (1945), pp. 35-47.

⁽²³⁾ Clement Paston (1609-62) held the manor of Binham in Norfolk. The extent of the integration of the English Catholic community is well illustrated by his relations with families who were also associated with the Towneleys. Clement married Dorothy Plumpton; the Plumptons were related to the Towneleys by marriage; and an account book of the Commonwealth period (Gascoigne E10/1 MS., Leeds Public Library) shows that the rents from the Plumpton estates at Waterton, Ruffarlington, Plumpton, Wolfpark and Axholme, were divided between the Plumpton, Towneley and Paston families.

Clement's eldest daughter, Mary, married Sir John Saville of Copley Hall, Yorkshire; the eldest daughter of this marriage, Elizabeth Marie, married Lord Thomas Howard, and Richard Towneley was a trustee to the settlements connected with this marriage. Lord Thomas Howard's first son, Thomas, became eighth duke of Norfolk and married the daughter and heiress of Sir Nicholas Sherburne of Stonyhurst.

Clement's second daughter, Margaret, married Richard Towneley; E. B. Burstall, "The Pastons and their Manor of Binham", in *Norfolk Archaeology*, Vol. 30 (1952), pp. 101-29; Rosamond Meredith, *Catalogue of the Arundel Manuscripts in Sheffield Public Library* (1965).

tic chemist), was from the latter branch of the family. He became a founder Fellow of the Royal Society.

Richard Towneley had a large family, five sons and six daughters; the eldest surviving son was Charles Towneley, who himself produced a large family at Towneley Hall during the latter years of Richard's life. As with many other Catholic families of similar social status, a large proportion of their children entered religious orders and settled on the continent.⁽²⁴⁾

The Restoration brought only temporary respite for the English Catholics, the last years of the reign of Charles II being marked by a renewal of anti-Catholic agitation. Thus, in January 1679, Flamsteed wrote to Towneley about the alleged Catholic plots to kill the King, regretting that Towneley was prevented from travelling from his home because of the precautionary measures against Catholics.

The brief reign of James II again improved the position of the Catholics, but the accession of William and Mary again brought rumours of Catholic plots, and Richard Towneley was accused of being implicated in the "Lancashire Plot" of 1694.⁽²⁵⁾ Indeed, he remained faithful to James II and his heir, supporting a Catholic priest of Towneley, Thomas Anderton, who said indentions "*pro Rege Jacobus III*" and "*Pro conversione Angliae*".⁽²⁶⁾ However, Richard and his brothers gave nothing more than passive approval to the cause, although Richard's grandchildren were more impetuous supporters of the Stuarts.⁽²⁷⁾

Richard Towneley's enthusiasm for natural philosophy was certainly an aid to his family's preservation. It enabled him to avoid entanglement in the dangerous intrigues of Restoration politics and it led to friendships with figures who were likewise dissociated from major political factions. He was therefore able

⁽²⁴⁾ Richard Towneley's two eldest sons died during childhood. The third was alive in 1678, when he attended Gray's Inn; he probably died shortly afterwards. Two other sons survived; the elder, Charles, became Richard's heir and produced a small family. The remaining son, Thomas, was educated at Douai and became a Catholic priest. Of Richard's six daughters, only one, Ann, appears to have married, while three, Frances, Margaret and Cecily, were nuns in Paris.

⁽²⁵⁾ W. Beaumont, *Jacobite Trials at Manchester in 1694*, Chetham Society, O.S., Vol. 28 (1873), pp. xviii, 35-6. As might be expected, Richard Towneley fell under suspicion at the time of the trials initiated by Titus Oates. Robert Balron named Towneley (together with Sir Thomas Gascoigne, Richard Sherburne the elder and Richard Sherburne the younger) in an anti-Catholic pamphlet in 1680, F. S. Colman, *op.cit.*, pp. 185-6.

⁽²⁶⁾ *Catholic Registers of Towneley Hall, Lancashire*, Catholic Record Society, Vol. 3 (1906), pp. 306-11.

⁽²⁷⁾ Two of Richard Towneley's grandchildren, John Towneley (1697-1782) and Francis Towneley (1709-46) were active in the armies of Charles Stuart. The former became an exile in France, where he achieved fame through translating Samuel Butler's *Hudibras* into French (1757). Francis Towneley was executed in 1746 for his part in the '45.

to claim some of the esteem which had become associated with the Fellows of the Royal Society.

Towards the end of their lives (after 1703), Richard and Charles Towneley spent more time at their town house in York and Richard was partially blind for some years, because of cataracts. This condition improved before his death, which was at York on 22 January 1707. He was buried at the Towneley Chapel at St. Peter's Burnley, and a memorial was erected to him by his brother Charles, who died in 1712.

Richard Towneley's monument bears two Latin inscriptions, the first, which he composed himself, was a modest epitome of his ancestry. It was devoted to the generous praise of his father, mother and wife. Charles Towneley added a passage speaking as his brother, "*non tam sanguinis, quam animorum conjunctione*".

"He lived to about the age of 78, swore to nobody, kind to all, cultivating especially the finer sciences and arts, himself being a skilled geometer: on account of which he held regular correspondence with the learned men of the period, who were not unfamiliar with the name of Towneley."⁽²⁸⁾

IV THE TOWNELEY GROUP, 1656-1707

The exclusion of the Towneleys from public life, combined with the careful attention which had been given to their education, meant that they had both leisure and academic learning to equip them for participation in the seventeenth-century scientific movement. Thus, we find that Richard Towneley had a knowledge of the works of English and continental philosophers. At the same time, he possessed an understanding of the astronomical works preserved by Christopher Towneley. In this he had an advantage over the natural philosophers in London and at the Universities, who had no access to the works of Horrocks and his colleagues until 1673.

Richard Towneley was primarily the perpetuator of the tradition of observational astronomy inherited from the northern pioneers. However, like the virtuosi of the Royal Society, he also embraced various other problems of natural philosophy. The problems which interested him—capillarity, the vacuum, ether theory, air pressure—also attracted the attention of the Royal Society. However, Towneley was unusual in his rigid adherence to the principles of Cartesian philosophy, which he

⁽²⁸⁾ The Latin inscription is given in full by Whitaker, *op.cit.*, p. 325. There is evidence for Richard Towneley's correspondence with R. Boyle, J. Collins, W. Croone, W. Derham, J. Flamsteed, P. de la Hire, M. Lister, Sir J. Moore, H. Oldenburg, W. Pope, H. Power, R. F. de Sluse, R. Thoresby, J. Woodward. Charles Towneley's claim was therefore well justified.

applied to these problems as well as to other questions in natural philosophy.⁽²⁹⁾

One of the characteristics of the experimental science of the seventeenth century was the widespread recognition of the value of group activity in the solution of its problems. This led to the formation of various formal and informal scientific societies, at first in Italy, later in Paris, London and Oxford. Richard Towneley, no less than the founders of the Royal Society, realised the value of the co-operative approach to scientific problems. Even Christopher Towneley had pioneered the exchange of scientific information and had realised the value of an extensive library.

When tranquillity returned during the Commonwealth, Richard Towneley again established Towneley Hall as a centre for the informal discussion of scientific problems. Also, like his friend, Henry Power, he assembled a valuable library, which was integrated into the already substantial library at his home.⁽³⁰⁾

The nucleus of the reconstituted Towneley group was Richard's own brothers, Charles, John and Francis. This was acknowledged by Henry Power, in his *Experimental Philosophy*, a work which embodied the researches of the Towneley group. He noted that the experiments on air pressure were assisted by Richard, Charles and John Towneley, as well as George Kemp.⁽³¹⁾

Power also acknowledged help from Richard and wrote of "Mr. Charles Towneley his Experiment, from which, he would deduce a Perpetual Motion".⁽³²⁾ Forty years later, Charles Towneley carried on an extensive correspondence with Ralph Thoresby, in which he disseminated varied scientific information from either Richard or himself.⁽³³⁾ Probably Christopher

⁽²⁹⁾ The most complete manuscript of Towneley to be preserved is "Some short considerations upon Mr. Hooke's attempt for the Explication of the Expt. of waters ascent into small Glasse Canes" (1665-7). This is prefaced by a long section concerned with justifying the Cartesian philosophy and the treatise itself contains a long section which attempts to explain various phenomena by reference to the Cartesian aether. This manuscript is in the Yale University Library.

⁽³⁰⁾ See note 2. The Catalogues of H. Power's Library, British Museum Sloane MS 1346; Sloane MS 4019, ff. 149-65. An account of Power's library is given by the present author in an unpublished thesis, London University (1964): *The Scientific Work of Henry Power, M.D.*

⁽³¹⁾ Henry Power, *Experimental Philosophy* (1663), p. 121. This work was divided into three main parts. The first and third, "Microscopical Observations" and "Magnetical experiments", were mainly Power's work. The second part dealing with experiments on air pressure as well as the Preface and accounts of experiments in coal mines were obviously influenced by Richard Towneley and other minor figures.

⁽³²⁾ *Ibid.*, pp. 117-9.

⁽³³⁾ Correspondence of Charles Towneley with Ralph Thoresby, Thoresby MSS, Yorkshire Archaeological Society Library, Leeds. This collection contains also one letter from Richard Towneley and one from his daughter Mary.

Towneley was also interested in the activities of his nephew, for he lived in the neighbourhood of Towneley until his death in 1674.

The Towneleys found that their experiments were of interest to some of their friends, and Richard even kept a servant employed in taking routine experimental measurements. This may have been George Kemp.⁽³⁴⁾ The group were soon extending their activities in the Burnley area; they carried barometers up Beacon Hill at Halifax and Pendle Hill.⁽³⁵⁾ Thermometers and barometers were taken down local mines⁽³⁶⁾ and visits were made to local archaeological sites, particularly if there was a chance of unearthing Roman coins.⁽³⁷⁾ They enlarged their circle of friends by spending some time at their town house at York, and their sister Katherine's house at Ollerton in Nottinghamshire, as well as by making more ambitious journeys to Cumberland and London.

Henry Power (1623-68) was probably the first natural philosopher to associate with Richard Towneley. Power lived at Halifax and he appears to have become acquainted with Richard Towneley soon after 1654, when he returned from Cambridge, where he had spent very nearly thirteen years, obtaining his M.D. in 1655.⁽³⁸⁾ During this time he had become an enthusiastic experimenter and was deeply impressed by the new mechanical philosophy. He retained these interests when he returned to Halifax and soon discovered that Richard Towneley had sympathetic views. Power's education had led him to become associated with some of the major figures in English natural philosophy. He was an intimate friend of Sir Thomas Browne, and also knew Francis Glisson, one of the pioneers of the Royal Society. When the Royal Society was formally inaugurated he became one of its earliest fellows, due to the influence of his friend John (later Archbishop) Tillotson.⁽³⁹⁾

Power communicated the results of his experiments to the

⁽³⁴⁾ In Towneley's letters to Oldenburg it was mentioned that he kept a servant engaged in taking routine experimental measurements. This may have been George Kemp, who was mentioned by Power as assisting in the Pendle Hill barometric experiments.

⁽³⁵⁾ H. Power, *op.cit.*, pp. 126-30. R. Towneley, Letter to Walter Pope, 16 October 1669, Royal Society, Guardbook T, no. 21.

⁽³⁶⁾ H. Power, *op.cit.*, "Subterraneous Experiments; or Observations about Coalmines", pp. 173-81. R. Towneley, Letters to Oldenburg, 15 April, 15 August, 20 September, 30 September 1672, Royal Society, Guardbook T, nos. 22-4.

⁽³⁷⁾ Charles Towneley, Letter to R. Thoresby, 19 September 1698, Thoresby MSS, Y2, printed in W. T. Lancaster, *Letters addressed to Ralph Thoresby*, Thoresby Society (1912), pp. 63-4.

⁽³⁸⁾ C. Webster, *The Scientific Work of Henry Power*, p. 2.

⁽³⁹⁾ *Ibid.*, p. 4.

Royal Society through William Croone, the Society's "Register", with whom he corresponded frequently between 1661 and 1663.⁽⁴⁰⁾ In late 1661, Towneley visited London and delivered one of Power's manuscripts to Croone, who introduced him to the London scientific meetings. Now he met Boyle, who had reached a critical stage in his experiments on air pressure, and at one of their meetings they discussed the nature of the relationship between the pressure and density of air. Towneley pointed out that he had derived the Law relating these two variables and he showed Boyle an incomplete treatise which he had composed on the subject. This was not published, but the results of their discussions were given by Boyle in 1662.⁽⁴¹⁾ In this, Boyle generously referred to his Law as "Mr. Towneley's hypothesis", although it was obvious from the account that the Law had been partially derived by Boyle himself. Boyle and Towneley had many common interests and during the next decade they interchanged information about the systematic use of the thermometer and barometer.⁽⁴²⁾

In October 1664, Power transferred his medical practice from Halifax to Wakefield, thus interrupting his partnership with Towneley, although their correspondence continued; Power obtained the *Philosophical Transactions* for Towneley and other friends in the area.⁽⁴³⁾

It was not long before Towneley found an even more illustrious colleague. This was the promising young astronomer John Flamsteed (1646–1719). He had only a limited academic education and, until 1670, most of his life was spent at his home near Derby. In about 1662, his interest in astronomy was aroused; soon he and his friends were making systematic observations and calculating eclipses.⁽⁴⁴⁾ With increasing proficiency, Flamsteed realised the limitations of his instruments and he turned to the London astronomers for help. This resulted in a visit to London at Easter 1670.⁽⁴⁵⁾ He made various con-

⁽⁴⁰⁾ Letters between H. Power and W. Croone, BM. Sloane MS 1326, ff.25–34. Letter from R. Towneley to W. Croone, 25 March 1667, Royal Society, Guardbook T., No. 19.

⁽⁴¹⁾ C. Webster, "Richard Towneley and Boyle's Law," in *Nature*, Vol. 197 (1963), pp. 226–8. See also "The Discovery of Boyle's Law and the concept of the elasticity of air", by the same author in *Archive for History of Exact Sciences*, Vol. 2 (1965), pp. 441–502.

⁽⁴²⁾ Towneley referred to his correspondence with Boyle in letters to Oldenburg, 30 September 1672, 29 January 1672/3, Royal Society, Guardbook T, Nos. 24–5. Boyle preserved some of Towneley's barometric records, *Works*, ed. T. Birch (1744), Vol. 5, p. 135.

⁽⁴³⁾ H. Power, Letter to an unidentified correspondent in York, 1 April 1667, BM Sloane MS 1326, ff.151–2.

⁽⁴⁴⁾ F. Baily, *Account of John Flamsteed* (1835), pp. 9–10.

⁽⁴⁵⁾ *Ibid.*, p. 28.

tacts, but his most fruitful one was with Sir Jonas Moore, who provided him with one of Towneley's micrometers and promised to obtain improved glasses for his telescopes. It was due to Moore's patronage that Flamsteed settled in London in 1674 and obtained the appointment as "King's Astronomer" in the following year.

It was probably through Moore and John Collins that Flamsteed was introduced to Towneley; this resulted in a friendship and correspondence which lasted from 1671 until at least 1687.⁽⁴⁶⁾ Flamsteed visited Towneley Hall for the first time in June 1671 and found Richard Towneley away from home, but his servants showed Flamsteed the collection of instruments and manuscripts of the master. It was not long before Flamsteed resumed his correspondence with Towneley and at the beginning of 1672 he visited Towneley Hall again to make a thorough examination of the manuscripts of Gascoigne and Crabtree. To his surprise he found that Gascoigne's treatment of geometrical optics was much more convincing than Descartes'. In the same year, Flamsteed was again "kindly received by Mr. Towneley with whose instruments I saw Mars near the middlemost of the three adjacent fixed stars".⁽⁴⁷⁾

In September 1672, Flamsteed spent a week at Towneley Hall transcribing Gascoigne's manuscripts. At the end of his transcription he appended the following note, which indicates the range of Towneley's astronomical instruments.

"It was my good hap in September last 1672 to visit my thrice worthy friend Richard Towneley Esq., at Towneley his owne house in Lancashire where at my returne, after 6 dayes stay, I obtained of him all the papers of his observations with an intent, here to transcribe them, for the use of my selfe (or if providence call mee hence by these distempers under which I am almost constant patient) of posterity: They were made by the helpe of his screwes [micrometers], placed upon the distinct appearance of the image in a telescope of convex glasses [Keplerian telescope]: what instruments hee used it appeares not by these papers often for hee hath three severall tubes [telescopes], one of 5, another of 6 and the longest of 12 feet long; which, if I mistake remember not, himself told mee hee

⁽⁴⁶⁾ Flamsteed's most extensive correspondence was probably with Towneley. He also exchanged many letters with Abraham Sharp of Bradford.

Letters from Flamsteed to Towneley: 1672/3-87, Royal Society MS 243. January 15 1673/4 and 11 April 1674, Greenwich MS 45 and 68 F. A summary of these letters is given by J. L. E. Dreyer, *The Observatory*, Vol. 45 (1922), pp. 280-94.

Letters from Towneley to Flamsteed: (almost all have been lost) 24 November 1675, Royal Society, Guardbook T, No. 29. 3 December 1677, Greenwich MS, 43.

Flamsteed wrote to Collins, in July 1670, "I thank you for your advice of writing to Mr. Towneley. I am at present calculating the moon's appulses for the next year, which, when I have finished, I will send him a specimen of," S. P. Rigaud, *Correspondence of Scientific Men* (1841), Vol. 2, p. 95. On 4 May 1671 Flamsteed reported that 'Mr. Towneley correspondes with me very familiarly, and promises me all the services he can do me in my studies,' *ibid.*, p. 113.

⁽⁴⁷⁾ F. Baily, *op.cit.*, pp. 29-30, 32.

used most commonly in his observations of the satellites [of Jupiter], but in measuring the breadth of the luminary I find that often hee hath used one of his shorter tubes: So hee has likewise informed mee that hee hath used 2 sorts of micrometer in his observations. . . . Mr. Towneley's assistant in these observations was Mr. Peter Giffard, brother to the owner of Whiteladies where our Liege the King was preserved after Woster battle, who is retained by Mr. Towneley for his companion and the assistant of his observations, a person as Mr. Towneley of a sober ingenuity, skil'd not in one but various sorts of knowledge.⁽⁴⁸⁾

This note is interesting in providing the only reference I have found to Peter Giffard, Richard Towneley's companion. The Giffards of Boscobel and Whiteladies were prominent recusants, who assisted Charles II after the battle of Worcester in 1652. Whiteladies was at that time owned by Dorothy Giffard, widow of John Giffard (d. 1647). Peter Giffard, was probably the latter's younger brother.⁽⁴⁹⁾

This period shows Towneley and Flamsteed co-operating in a wide range of astronomical studies as well as exchanging meteorological information. One of their investigations involved the exact measurements of the orbits of Jupiter's satellites, which Flamsteed communicated to Isaac Newton.⁽⁵⁰⁾ Towneley showed great enthusiasm for Newton's work, which was communicated to him by his London friends.⁽⁵¹⁾

There is only slight information about Towneley's northern associates at the end of the century, but their activity was probably not diminished, since Richard Towneley took care to associate with northern natural philosophers of the rising generation, such as Dr. Walter Pope (d. 1714) and Dr. John Woodward (1665–1728) of Gresham College; Martin Lister (1638?–1712) of York and Ralph Thoresby (1658–1725) of Leeds.⁽⁵²⁾ Although Ralph Thoresby corresponded with Charles and Richard Towneley for over ten years, he recorded only one visit to Towneley Hall; this was on 1 and 2 September 1702. He passed through the Pendle district and:

⁽⁴⁸⁾ Royal Observatory, Herstmonceux, Flamsteed MSS, Vol. 40, f.46.

⁽⁴⁹⁾ Charles II was conducted to Whiteladies by Charles Giffard, an officer in the Royal army. He was hidden there on 4 September 1651. Shortly afterwards, on his way to Boscobel House, which was, like Whiteladies, owned by the Giffards, Charles hid in the oak tree; an event which brought fame to the Giffards and Boscobel. I have found no direct reference to Peter Giffard, Towneley's companion, in the accounts of the Giffard family. George Wrottesley, "The Giffards", *Collections for a History of Staffordshire*, N.S., Vol. 5 (1902).

⁽⁵⁰⁾ I. Newton, *Mathematical Principles*, ed. W. F. Cajori (1960), p. 556.

⁽⁵¹⁾ R. Towneley, Letters to Collins, 1671/2, S. P. Rigaud, *op.cit.*, Vol. 1, pp. 184–95.

⁽⁵²⁾ For Thoresby, see note 32. For letter from Towneley to Pope, see note 34. Walter Pope had been at Cambridge with Power and they had co-operated on air pump experiments in 1663, Letter from R. Towneley to M. Lister, 3 October 1693, Royal Society, Guardbook T, No. 30. For Woodward, see letter from Charles Towneley to R. Thoresby, 31 January 1702/3, Yorkshire Archaeological Society, Thoresby MS, Y2.

'hastening to Towneley, where we were very kindly received by that famous mathematician and eminent virtuoso, Richard Towneley, Esq. and his brother Charles (The Governor) my old correspondent; and also the converse of Mr. Trafford of Trafford, Dr. Prescott, etc.'⁽⁵³⁾

Towneley had obviously assembled many of his scientific associates in order to meet the illustrious Leeds antiquary. On the following day, Thoresby was shown a whole range of Richard Towneley's scientific instruments and experiments. He saw the rain gauge set up against one of the turrets of the Hall; a brass quadrant constructed by Adams;⁽⁵⁴⁾ a carriage designed to pass smoothly over rough stones; methods of propagating conifers by cuttings; and a sun-dial. But the most impressive item was the collection of scientific and historical manuscripts.⁽⁵⁵⁾

Thoresby was so impressed by this collection and the assembly of northern virtuosi, that he referred to Towneley Hall as "this college, or castle like house", and he spent the day conversing with:

'the three brothers, Mr. Trafford, and other strangers, in the garden-house, in the midst of the fish-pond in the garden, except that I stole a little time to peep into some volumes of Mr. Christopher Towneley's MSS of pedigrees.'⁽⁵⁶⁾

One notable friend of the Towneleys was absent from this meeting. This was Sir Nicholas Sherburne (d. 1717), of Stonyhurst. Thoresby passed by Stonyhurst, only three days after visiting the Towneleys. He wished very much to see Sherburne's large collection of Roman coins, but he thought it diplomatic to avoid meeting Sherburne, who was "reputed a stiff Papist".⁽⁵⁷⁾ The Towneleys were obviously less suspect than the Sherburnes at this time. The two families were of similar social status and had enjoyed a similar history during the seventeenth century. Both had successfully preserved their wealth and their Catholic religion. Sir Nicholas's father, Richard, was educated at St. Omer's at about the same time as Charles and John Towneley.

Sir Nicholas Sherburne was a man of considerable intellectual capacity, although his energies were probably not directed towards science. His main interest was in the extension of his

⁽⁵³⁾ R. Thoresby, *Diary 1677-1724*, ed. J. Hunter (1830), Vol. 2, p. 386. Humphrey Trafford (d. 1716) of Trafford, was a member of a well-known Lancashire Catholic family. He was educated at Rome and Douai. Dr. Prescott may have been one of the Prescots of Dalton, Wigan, who were on the recusant roll of 1641; *V.C.H., Lancashire*, Vol. 4, pp. 100-1, 333.

⁽⁵⁴⁾ J. Adams (fl. 1670-96), was advised by Flamsteed on suitable instruments for a geodetic survey of England and Wales. He produced a surveying quadrant with perspective sights. E. G. R. Taylor, *The Mathematical Practitioners of Tudor and Stuart England* (1954), p. 262.

⁽⁵⁵⁾ These included the manuscripts of Crabtree, Gascoigne and Horrocks.

⁽⁵⁶⁾ R. Thoresby, *Diary*, p. 387.

⁽⁵⁷⁾ *Ibid.*, p. 393.

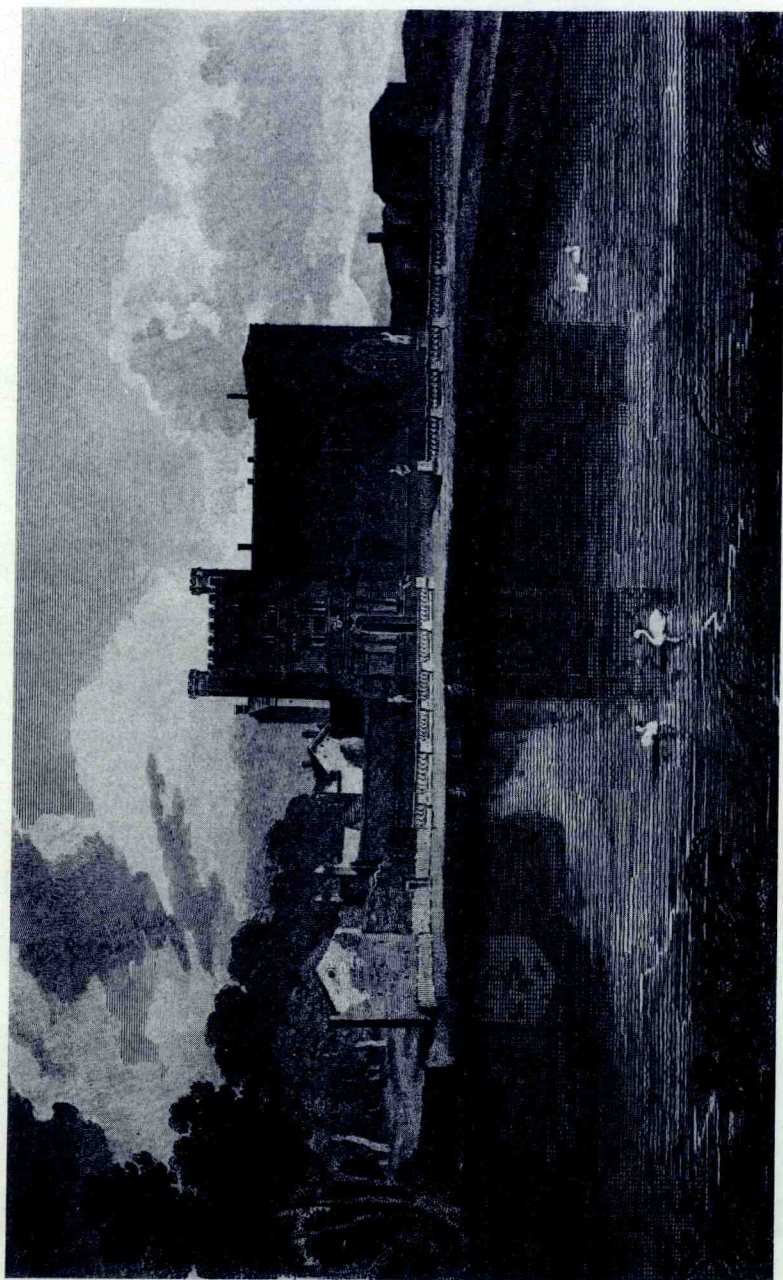


Plate 9.

STONYHURST FROM THE NORTH-EAST

An engraving by James Basire, based on a drawing by J. M. W. Turner, 1799 (Whitaker, *op. cit.*, p. 464).

house and in planning extensive waterworks. He also spent a considerable sum of money on introducing the jersey wool spinning industry to his area and in training the local inhabitants to use spinning wheels.⁽⁵⁸⁾ He was related to Sir Edward Sherburne (1618–1702), the poet and astronomer, who has previously been mentioned as Christopher Towneley's friend. It was Sir Nicholas who supported Sir Edward after he had resigned his position of clerk of the Ordinance in 1668. Sir Edward was also an acquaintance of Richard Towneley and was one of the group who received Sir Jonas Moore's patronage during the years following the Restoration. Both Sir Jonas and Sir Edward were buried in the Tower Chapel.

It is a pity that the records about the activities of Richard Towneley and his associates are so incomplete, but they indicate that the Towneley group had a long period of activity during the seventeenth century. The few records that remain show the pre-eminent role of Richard Towneley in perpetuating the tradition of experimental science, originated by William Gascoigne and his collaborators. It was therefore with justice that Charles Leigh, in surveying the contributions to science by northern authors, should write: "The World owes a great many Obligations to the great industry and knowledge of Richard Towneley of Towneley".⁽⁵⁹⁾

V CONCLUSIONS

The present article has assembled information about Richard Towneley in order to present, for the first time, an accurate brief account of his life and associates. Such a survey is an important preliminary to a fuller examination of his scientific work, which can only be completed when more of his manuscripts are identified.

It has been emphasized that Richard Towneley was not an obscure English gentleman-amateur, working in complete isolation at his country seat. He had inherited from his uncle's generation a tradition of systematic experimental inquiry which was similar to that of the founders of the Royal Society. He perpetuated this tradition by publicising the manuscripts which his uncle had assembled. At the same time he pursued many of the lines of investigation which had been initiated by the older astronomers. His realisation of the importance of the group investigation of scientific problems resulted in his associating

⁽⁵⁸⁾ John Gerard, *Stonyhurst College* (1894), pp. 69–81.

⁽⁵⁹⁾ Charles Leigh (1662–1701), *The Natural History of Lancashire, Cheshire and the Peak in Derbyshire* (1700), Book II, p. 17.

with an assemblage of enthusiasts, ranging from Flamsteed, Power and Christopher Towneley, to such less important figures as his three brothers, Sir Nicholas Sherburne, Giffard, and Trafford. Like their forerunners, Horrocks, Crabtree and Gascoigne, they had only limited contacts with the major scientific movement in London and at the universities. After the foundation of the Royal Society, it was inevitable that their work should become overshadowed and they became content to make minor contributions to its work. Social and geographical causes prevented their complete integration with the Royal Society. Henry Power was never more than a peripheral member; Flamsteed became closely associated with its activities only when he settled in London. The Towneleys, Giffard, Sherburne and Trafford probably had religious motives for remaining outside the Society.

Yet it must not be assumed that Richard Towneley was unfamiliar with the current issues in natural philosophy. He was careful to buy important English and foreign works for his library, as well as the *Philosophical Transactions of the Royal Society*. He was also able to visit London occasionally, and there are records of visits made in 1661/2, 1670, 1674 and 1676. They were usually to his old friend, Sir Jonas Moore, through whom he met Hooke, Collins and Oldenburg.⁽⁶⁰⁾ Moore also kept in contact with Sherburne and Wharton, who had served Charles I during the civil war. Flamsteed joined Moore's circle after 1674. Unfortunately only a fraction of Towneley's correspondence remains, but it appears that he corresponded with Boyle, Oldenburg and Collins, of the Royal Society, as well as with P. de la Hire and R. F. de Sluse in France.⁽⁶¹⁾ The few of Towneley's manuscripts to be published by the Royal Society were communicated by Croone, Flamsteed and William Derham. His longest correspondence was with Flamsteed, while a common interest in meteorology caused his association with Derham.⁽⁶²⁾

A second point of emphasis in the present article, has been on the significance of Towneley's social and religious background. It is only when he is seen as a representative of the

⁽⁶⁰⁾ R. Hooke, *Diary, 1672-80*, ed. H. W. Robinson, K. W. Adams (1935), p. 246. Hooke had other meetings with Towneley and Moore, and on 22 August 1676 he dined with Brouncker, Moore, Wharton, Sherburne and Towneley at Greenwich.

⁽⁶¹⁾ For a complete list of Towneley's correspondents, see note 28.

⁽⁶²⁾ Croone communicated an extract from Towneley's letter describing the micrometer, *Phil. Trans.*, Vol. 2, No. 25 (1667), pp. 457-8. Hooke gave a further description of the micrometer, *Phil. Trans.*, Vol. 2, No. 29 (1667), pp. 541-4. Flamsteed communicated Towneley's account of the eclipse of 1676, *Phil. Trans.*, Vol. 11, No. 127 (1676), pp. 602-4.

Lancashire Catholic gentry that his role in the seventeenth-century scientific movement can be assessed. His Catholicism was an important factor in limiting his contacts with the Royal Society; his friends were predominantly Catholic; and, most significantly, his education had given him familiarity with the current intellectual movements in France.

Many historians have sought to relate the rising scientific movement in England with the Puritan influence, and have shown that Puritans formed the nucleus of Gresham College and the early Royal Society.⁽⁶³⁾ Equally they have been unable to find examples of Catholic scientists in England during this period. This has led to the view that Puritanism favoured the reformed, experimental natural philosophy, while Catholics upheld reactionary peripatetic philosophy.⁽⁶⁴⁾ Clearly, the Towneley group provide an exception to this generalisation.

⁽⁶³⁾ The idea that there was an intimate association between Puritanism and science emerged originally from D. Stimson's studies on the origins of the Royal Society, e.g. particularly "Dr. Wilkins and the Royal Society", *Journal of Modern History*, Vol. 3 (1931); "Puritanism and the 'New Philosophy' in Seventeenth Century England", *Bull. Inst. of History of Medicine*, Vol. 3 (1935). These ideas were elaborated by R. F. Jones, *Ancients and Moderns* (1936), and particularly by R. K. Merton, "Science Technology and Society in Seventeenth Century England", *Osiris*, Vol. 4 (1938), pt. II. Science was regarded by these authors as an integral aspect of seventeenth-century Puritanism. More recently, C. Hill has extended this thesis even further, to regard the experimental science of the seventeenth century as a development of the Puritan-artisan science of the Elizabethan age – *Intellectual Origins of the English Revolution* (1965). This is in sharp conflict with the interpretations of the Elizabethan period of M. M. Knappen, *Tudor Puritanism* (1939), P. H. Kocher, *Science and Religion in Elizabethan England* (1953), and M. H. Curtis, *Oxford and Cambridge in Transition, 1558–1642* (1959).

While the thesis put forward by Hill and Merton meets opposition from some students of Elizabethan history, it meets with few objections from seventeenth-century historians. The limitations of the idea are pointed out by Curtis, *op.cit.*, and by T. K. Rabb, "Puritanism and the rise of experimental science in England", *Cahiers d'Histoire Mondiale*, Vol. 7 (1962). These contributions led to an exchange of ideas between Hill, Rabb and H. F. Kearney in *Past and Present*, Vols. 28, 29 (1944), Vols. 31, 32 (1965). The present author feels that the controversy can be settled only when more detailed studies of the structure of the scientific community have been made. The present article represents one stage in such a survey. It must be remembered that E. G. R. Taylor and F. R. Johnson, whose evidence has been widely utilised in the controversy, have provided a detailed analysis of only one segment of the scientific community – the practical mathematicians and astronomers. More detailed studies of the universities, of the College of Physicians, of the Companies of Distillers, Apothecaries, and Barber Surgeons, as well as of provincial and exiled scientists are required.

J. B. Conant in "The advancement of learning during the Puritan Commonwealth", *Proceedings of the Massachusetts Historical Society*, Vol. 66 (1936/41), has made a short but constructive contribution (based on a study of the universities) suggesting that Puritanism may be regarded as one of the whole complex of factors which contributed to the growth of science in Commonwealth England.

⁽⁶⁴⁾ C. Hill, *op.cit.*, pp. 4–5. See also, Hill's reply to Kearney, *Past and Present*, Vol. 29 (1964), pp. 88–9. Hill believes that the Royalists, like the Catholics, held retrogressive views in natural philosophy. In his *Intellectual Origins of the English Revolution*, p. 118, he quotes from M. Nicholson the statement that the

Its members were predominantly non-Puritan in sympathy, while some were specifically Catholic. When it became necessary to resolve the Parliamentary-Royalist dispute by civil war, the group favoured the king and its leading members joined the royal army. At the same time, their bias in natural philosophy was strongly experimental and they adopted the Copernican rather than Ptolemaic world system. The Towneley group may be a limited exception to a general trend in which Puritanism provided the spur to the English scientific movement. On the other hand, they may be representatives of a non-Puritan scientific movement of significant proportions. Their existence may, therefore, be important evidence in re-evaluating a popular modern historical doctrine as well as providing an illustration of a provincial scientific movement in seventeenth-century England. In this period there were evidently examples of English Catholics and Puritans who adhered to the scholastic philosophy and others who accepted the mechanical and experimental philosophy. Thus, while the role of Catholics in the English scientific movement was limited, it was not necessarily reactionary. There were relatively few Catholic natural philosophers, but Catholics formed only a tiny percentage of the population. The civil war reduced their impact still further, due to their Royalist bias. This resulted in some withdrawing from public life, others becoming exiled. Sir Kenelm Digby and the second Marquis of Worcester provide examples of exiled Catholic natural philosophers; Francis Linus⁽⁶⁵⁾ and Thomas White taught at English Catholic colleges on the continent. Each reacted differently to the problems of natural philosophy, and it is not possible to detect a common "Catholic" approach to science. In Richard Towneley one finds a particularly happy compromise between the theoretical approach of Descartes and the experimental tradition inherited from Gilbert, Bacon and Harvey.

Civil War "was fought between rival schools of astronomy, between Parliamentary heliocentrists and Royalist Ptolemaics. Ptolemy perished with Charles I" ("English Almanacks and the 'New Astronomy'", *Annals of Science*, Vol. 4 (1939), p. 20.)

⁽⁶⁵⁾ Since the completion of the present article, Mrs. Mary Brigg's study of the Walmesley family documents has shown that Towneley's neighbour, the Catholic Richard Walmesley, of Dunkenhall, was associated with the Towneley group. Indeed, the present author has previously noted Walmesley's correspondence with Henry Power on microscopy. Walmesley's particular importance is his patronage of Francis Linus, the famous adversary of Boyle and Newton. Linus spent some time in Lancashire and may well have become acquainted with Richard Towneley. See Mrs. M. Brigg's forthcoming article in *Lancs. & Ches. Ant. Soc. T.*