Enlightened Amateurs and Professional Academics:

Astronomy in Eighteenth-Century Scotland

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The starting point for my talk is an article entitled 'The Failure of Scottish Astronomy in the Eighteenth Century' by Ian Stuart of the Hamilton Centre published in the National Newsletter of the Royal Astronomical Society of Canada in 1981. Stuart rightly emphasizes that the Scots made significant contributions to medicine and engineering during the course of the eighteenth century. The Edinburgh medical school, founded in 1726, boasted a succession of distinguished professors of medicine, including Robert Whytt (1714-1766), William Cullen (1710-1790), and John Gregory (1724-1773). In the field of engineering, James Watt (1736-1819) stands out. Nor should we ignore the fact that the Scots were also leaders in the sciences of chemistry and geology, thanks to the work of Cullen, his student Joseph Black (1728-1799), and James Hutton (1726-1797). By contrast, Stuart paints a bleak picture of the study of astronomy in eighteenth-century Scotland and identifies seven factors that led to the 'failure' of Scottish astronomy.

First, Stuart points out that good instruments were costly. Consequently, only a few wealthy amateurs could afford such instruments and the Scottish universities were hampered in their attempts to acquire the hardware needed for observational astronomy by poor funding. Secondly, there was the problem of safe transport. The lack of instrument makers in Scotland meant that most instruments had to be imported from elsewhere, with London being the main source for telescopes and other pieces of equipment. Poor roads and shipment by sea inevitably

led to damage, while the cost of transport also further increased the price of instruments. Moreover, the lack of an adequate road system in Scotland limited access to some of the best sites for observation. Thirdly, urban development meant that the smoke and heat generated in large burghs like Edinburgh and Glasgow interfered with observation. Fourthly, Scotland's northerly location made observation difficult. Fifthly, the inclement Scottish weather routinely interfered with astronomical observation. Sixthly, the mathematical language used by Scottish astronomers inhibited the progress of astronomical research in eighteenth-century Scotland. That is, the Scots' use of what Stuart calls 'the cumbersome outmoded geometrical method' meant that they were unable to keep pace with continental astronomers who employed more advanced mathematical techniques in their calculations. Lastly, Scotland suffered a 'brain drain' in the eighteenth century, with a number of leading Scottish astronomers finding fame and fortune in England.

Stuart also makes two additional historical claims that deserve mention. First, according to Stewart no native tradition in astronomy - and the sciences more generally - existed prior to the eighteenth century. Stuart maintains that the study of the sciences flourished because of the stimulus of ideas from abroad, and he mentions the significance of the Grand Tour in relation to the flowering of Scottish culture after 1700. Secondly, he suggests that Newton's 'system of the world' was only widely accepted in Scotland from roughly the 1720s onwards, largely due to the work of the great Scottish mathematician Colin Maclaurin (1698-1746). For Stuart, Scotland was thus a scientific backwater at the turn of the eighteenth century because Scottish men of science lagged behind their counterparts elsewhere in Europe in adopting Newtonian natural philosophy.

While it is true that the Scots were not in the forefront of astronomy during the eighteenth century, Stuart's characterization of astronomical research in Scotland in the period as being a 'failure' is, I think, overstated. Also, his claim that there was no native tradition in Scottish astronomy prior to 1700 cannot be sustained, nor can his assertion that it was only relatively late in the day when Scottish astronomers took up Newton's 'system of the world'. As we shall see, the Scots were, if anything, in the vanguard of the rise of Newtonian natural philosophy in Europe. Rather than attempt to provide a general overview of the cultivation of astronomy in eighteenth-century Scotland, I want to focus on one figure, the Scottish polymath Thomas Reid (1710-1796), and use his career to illustrate various facets of the Scottish astronomical tradition during the period now known as 'the Scottish Enlightenment'. In particular, I want to emphasize that the research that took place in eighteenth-century Scotland built on foundations that were laid in the seventeenth century, and that even though Scotland did not produce an astronomer of the stature of, for example, William Herschel (1738-1822), the work done by Scottish astronomers in both observational and physical astronomy during the course of the eighteenth century was far from negligible. Moreover, Reid serves as an especially illuminating example of the pursuit of astronomy in the Scottish Enlightenment for three reasons. First, during his long career he was both an enlightened amateur and a professional academic who taught astronomy in a university setting. Secondly he studied and taught in Aberdeen, and later established an international reputation as the Glasgow Professor of Moral Philosophy, in succession to Adam Smith (1723-1790). Tracking his career thus allows us to gain some sense of how the Scottish Enlightenment was configured outside of Edinburgh. Thirdly, Reid's family connections well

illustrate the continuities between the Scottish scientific and learned communities of the seventeenth and the eighteenth centuries.

Thomas Reid as Student: Marischal College 1722-1731

Thomas Reid was born in Strachan, Kincardineshire, on 26 April 1710. His father, Lewis Reid (1676-1762), was the minister of the parish. Lewis Reid descended from a distinguished family in the north east of Scotland. An earlier Thomas Reid (*d.* 1624) served as the Latin secretary to James I of England and at his death left a notable library to his alma mater, Marischal College Aberdeen. Our Thomas Reid's mother, Margaret Gregory (1673-1732), was one of the illustrious Gregory family, whose members did so much to further the study of mathematics, natural philosophy, and medicine in Scotland from the seventeenth through to the nineteenth century. Margaret's father, David Gregory of Kinnardie (1625-1720) was a laird known for his considerable expertise in the fields of mathematics, medicine, and natural philosophy. Our Thomas Reid's family background thus points to the fact that seventeenth-century Scotland was not the barren cultural and scientific wasteland that Ian Stuart makes it out to have been.

After studying at the parish school in nearby Kincardine O'Neil, Reid briefly attended the Aberdeen Grammar School before entering Marischal College in October 1722. In terms of the study of the natural sciences, Marischal had benefited enormously from the bequest the college had received in the previous century from the Aberdonian mathematician and astronomer Duncan Liddell (1561-1613). Like many of his fellow Scots over the centuries, Liddell left his native

Scotland in order to carve out a successful career elsewhere. Liddell studied and taught mathematics and medicine at various universities in northern Protestant Europe during the latter part of the sixteenth century, and even visited the reclusive Danish astronomer Tycho Brahe (1546-1601) at Uraniborg on the island of Hven in 1587 and again in 1588. By 1612 Liddell was back in Scotland. In his will of 1612 he bequeathed Marischal College his library, money for student bursaries, his mathematical instruments, and a sizeable endowment to establish a Professorship in Mathematics. Liddell specified that the professor should, in the first instance, be Scottish and that they should be 'well versed in Euclid, Ptolemye, Copernik [and] Archimede'. When Reid entered Marischal in 1722, the Liddell Professor was Colin Maclaurin, who occupied the chair from 1717 until 1726.

Maclaurin had a somewhat chequered career at Marischal. During his tenure of the Liddell chair, he was frustrated by the large number of students that he had to teach and the inadequate provision of scientific and astronomical instruments that he needed for his teaching and research. Although an observatory had been built at the college in 1694, the structure had been left vacant because Liddell's collection of instruments had either fallen into serious disrepair or was simply not good enough to be used. The stock of instruments at the college continued to be a problem in the early eighteenth century and, in 1726, the faculty at Marischal launched a public appeal for funds to enable the college to purchase 'a compleat set of instruments' to facilitate the teaching natural philosophy. It is unclear how much the college was able to raise through this fund raising scheme. We do know that scientific instruments were acquired in the late 1720s and a description of the college published in the 1730s noted that at Marischal there was 'a Room well furnished with Instruments, etc. where are read publick

Lectures of Natural and Experimental Philosophy, and Experiments performed'. Stuart's claim that the development of observational astronomy in eighteenth-century Scotland was hampered by a lack of funding thus holds true up to a point with reference to Marischal College, although the situation was by no means as dire as he suggests.

Even though it is unlikely that Thomas Reid gained any hands-on experience using a telescope or other observational apparatus while he was an undergraduate at Marischal College, he was given a good grounding in Newtonian natural philosophy by Maclaurin and by his regent, George Turnbull (1698-1748). In the period roughly 1690 to 1710, those teaching natural philosophy at the college increasingly rejected the scientific ideas of René Descartes (1596-1650) in favour of the Newtonian system of the world, and in doing so reproduced the pattern of curriculum change found at the other Scottish universities. Contrary to what Ian Stuart claimed in 1981, Maclaurin did not revolutionize the teaching of the sciences in Scotland by introducing the ideas of Newton. Rather, Maclaurin built on an already flourishing tradition of Newtonianism in Scotland to which he added further lustre through his publications and teaching at both Marischal College and the University of Edinburgh.

That Reid was something of a scientific prodigy like his teacher Maclaurin is illustrated by one of his earliest surviving manuscripts which dates from October 1729. The manuscript was written while Reid was a divinity student at Marischal, and consists of detailed reading notes from the first edition of Newton's *Principia mathematica*. The notes are largely taken from Book III of Newton's *Principia*, wherein Newton outlines his 'system of the world'. It is striking that Reid was a sufficiently accomplished mathematician to spot some problematic propositions in Book III, just as his kinsman, the mathematician and natural philosopher David Gregory (1661-

1708) had done in the 1690s. By the time Reid left Marischal in 1731 to pursue a career as a clergyman in the Church of Scotland he had thus shown himself to be a highly competent mathematician who had mastered the mathematical and theoretical fundamentals of Newtonian natural philosophy.

Thomas Reid as Librarian and Clergyman: Marischal College and New Machar 1733-1751

Like a number of his fellow divinity students in Scotland, Thomas Reid had difficulty finding himself a parish after he was licensed as preacher by the presbytery of Kincardine O'Neil in September 1731. For the next two years Reid eked out a living by serving as the clerk of the presbytery and acting as an occasional preacher. Reid must have concluded that his prospects were looking increasingly poor, for in 1733 he temporarily abandoned his clerical career and exploited his family connections to become the Librarian at Marischal College (the salary for this position came from a bequest made by his ancestral namesake in the 1620s). Back in Aberdeen, he was reunited with his old classmate and close friend, John Stewart (*d*. 1766), who had succeeded Colin Maclaurin as the Liddell Professor of Mathematics at Marischal in 1727. It was through Stewart that Reid became part of a network of amateur and academic astronomers in Scotland organized by Maclaurin and loosely affiliated with the Philosophical Society of Edinburgh (founded in June 1737).

Even though Maclaurin was desperate to escape the college politics at Marischal in the early 1720s, he seems not to have borne a grudge against his previous employer. In 1732 Maclaurin facilitated the gift of a good quality telescope made by the London instrument maker

George Hearne (*fl*. 1725-1741) from the aristocrat and amateur astronomer James Douglas (1702-1768; later the 14th Earl of Morton) to Stewart for use at the college. The gift of the telescope meant that Stewart and his associates in the north east of Scotland were able to provide Maclaurin with reliable observational data, which they duly did in 1737, when Maclaurin and his Scottish colleagues observed a solar eclipse that occurred in February of that year. Stewart sent Maclaurin the observations that he and several other unnamed 'gentleman' made in the area around Aberdeen. Maclaurin in turn collated the observations sent to him by Stewart with those provided by other members of Maclaurin's network of Scottish astronomers and communicated them to the Royal Society of London. The observational data was then published in the *Philosophical Transactions* of the Royal Society of London for 1737-38.

It is unclear whether Thomas Reid took part in this collaborative enterprise. It may be that he was too distracted by the divisive church politics that clouded his ordination as the minister of New Machar, a rural parish to the north west of Aberdeen. Once he was settled at New Machar, we know from Reid's manuscripts that he engaged in observational astronomy. He mentions, for example, observing a comet in 1744, although it is unclear whether he had his own telescope to do so. In 1748 Reid was part of a network of Scottish astronomers organized by the physician Alexander Monro *primus* (1697-1767) and the Philosophical Society of Edinburgh to observe an annular eclipse of the sun that took place in July. As in 1737, John Stewart coordinated the observers dotted around Aberdeen (including Reid at New Machar), collected their observations, and then forwarded them to Monro in Edinburgh. Monro subsequently sent them to the Royal Society of London and the Scottish data was again published in the *Philosophical Transactions*.

Reid's participation in this collaborative project illustrates the fact that although he was based in a somewhat obscure rural parish in the north east of Scotland, he was nevertheless a part of the Scottish scientific community and that the remained in close personal contact with John Stewart. Church business periodically took Reid to Aberdeen, where he no doubt met with Stewart. They also corresponded, but few letter between the two men survive. Of the three items of extant correspondence, two deal with astronomy. One letter from Reid to Stewart shows that they were both following with interest one of the major scientific controversies of the 1730s, namely the dispute over the shape of the earth. Newton had claimed in Propositions 18 and 19 of Book III of the *Principia* that the earth is slightly flattened at the poles, whereas the Cartesian position, as articulated by Jacques Cassini (1677-1756), was that the earth is slightly distended at the poles. In 1736 a French expedition funded by Louis XV and led by Pierre-Louis Moreau de Maupertuis (1698-1759) travelled to Lapland in order to settle the dispute by measuring a degree of meridian arc near the north pole. Maupertuis' results, which confirmed the Newtonian view, were published in 1738 in Maupertuis' *Sur la figure de la terre*. Extant reading notes reveal that Reid read and digested an English translation of Maupertuis' book in November 1739. Later, in January 1751, he read an account of the French-Spanish expedition to Peru led by Pierre Bouguer (1698-1758), who set out to measure a degree of meridian arc near the equator. The expedition left for Peru in 1735 and remained there for almost a decade. Bouguer eventually published his findings his *La figure de la terre* (1749). Apart from providing additional data related to the question of the shape of the earth, Bouguer's book underlined for Reid the difficulties involved in obtaining accurate measurements, be they in the use of sophisticated surveying techniques or in making astronomical observations with precision instruments.

During the period 1737 to 1751 Reid was, to use the English phrase, a 'parson naturalist'. That is, Reid was someone who combined the onerous duties of a parish minister with a serious avocational interest in the natural sciences. It should be emphasized that, for Reid, his scientific pursuits were rooted in his religious faith, and that his brand of rational Christianity was intimately connected with his Newtonian world view. Reid undoubtedly agreed with Newton's claim in the 'General Scholium' of the second edition of the *Principia* (1713) that 'this most elegant system of the sun, planets, and comets' in our solar system 'could not have arisen without the design and dominion of an intelligent and powerful being'. Reid would likewise have endorsed Colin Maclaurin's assertion that 'natural philosophy is subservient to purposes of a higher kind, and is chiefly to be valued as it lays a sure foundation for natural religion and moral philosophy; by leading us, in a satisfactory manner, to the knowledge of the Author and Governor of the universe'.

Thomas Reid as Regent: King's College 1751-1764

In the autumn of 1751 Reid's career changed direction dramatically, for he was elected as a regent at King's College Aberdeen on 25 October 1751. As a regent, he was obliged to teach the whole of the three-year course of philosophy that formed the core of the arts curriculum. This meant that Reid was now required to teach astronomy, along with basic algebra, geometry, the other branches of natural philosophy (which for Reid included mechanics, cohesion, magnetism, electricity, hydrostatics, and optics), natural history, and the subjects encompassed by moral philosophy.

Unfortunately we know little about the teaching of astronomy and the natural sciences at King's College prior to Reid's appointment in October 1751. The surviving correspondence of the clergyman George Garden (1649-1733), who was the younger brother of the King's Professor of Divinity, James Garden (1647-1726), tells us that in the 1680s members of their circle were cultivating the 'new science' of the seventeenth century and that this group were 'furnished with pretty good Telescopes, Barometers &c. and as exquisite Microscopes, as perhaps are to be found [anywhere] in Europe'. By 1700 a number of the regents at King's had begun to teach Newton's theory of light and colours as well as Newton's theory of gravitation and, in 1703, the Newtonian cast of the college was further strengthened through the founding of a chair of mathematics. The first incumbent, Thomas Bower, was a protege of the prominent Edinburgh Newtonian Archibald Pitcairne (1652-1713). However, no record of Bower's teaching survives, although the college minutes from King's record that he purchased a set of 'mathematical instruments' using funds raised through a public appeal. When Bower left King's around 1713, the chair of mathematics was left vacant until a successor was finally appointed in October 1732. The new professor, Alexander Rait, taught public and private classes in mathematics (which probably covered some astronomy) and also used a sizeable bequest of £50 to purchase 'mathematical instruments proper to make physical mathematical experiments'. Rait died in 1751, and it is significant that Reid was appointed to replace him even though Reid was not designated as the professor of mathematics (in fact, the chair was allowed to disappear). There was the clear recognition at King's that Reid was a highly competent mathematician and man of science, and there is little doubt that his expertise in the natural sciences far outstripped that of his fellow regents at the college.

What Reid taught in his course of astronomy remains something of a puzzle because of the fragmentary nature of his surviving manuscripts and because the only known set of student notes from his lectures on natural philosophy (which dates from 1757-58) are incomplete. The blank leaves in the section on astronomy signal the fact that the set of notes provide only a partial snapshot of what Reid covered in his course. The initial lectures are taken up with the rudiments of astronomy: the order of the planets and their motions around the sun; accounts of lunar and solar eclipses; the phases of the moon; and the retrograde motions of the planets. But Reid also discussed at length the irregularities of moon's motion, the precession of the equinoxes, the tides, and two discoveries made by the Astronomer Royal James Bradley (1693-1762), namely the nutation of the earth's axis and the aberration of light. From the limited evidence available, therefore, it would seem that Reid's astronomy lectures served primarily as a basic introduction to the science, although in the case of the aberration of light he also incorporated material more directly related to his own research interests.

Little evidence remains of Reid's activities as an observational astronomer while he was teaching at King's. The fact that he took the trouble to establish the latitude of the Canonists Manse, where he and his family lived during their time in Old Aberdeen, implies that he occasionally observed the heavens from his home but no record survives of his having done so. We do, however, know that Reid helped to organize a group of his colleagues in Aberdeen to observe the transit of Venus which occurred on 6 June 1761. Three years previously in 1758, Reid had been a founding member of the Aberdeen Philosophical Society (popularly known as the Wise Club) which brought together academics from the two Aberdeen colleges, plus other men affiliated with the core members. At a meeting held on 12 April 1758, the members of the

Society discussed how best to carry out and interpret the observations of the predicted transit. The Wise Club was probably one of the first groups (if not the first) in Britain to do so, insofar as the Royal Society in London did not plan for the forthcoming transit until June 1760. Unfortunately, the Club's preparations bore little fruit. Reid and four other unnamed members of the Club met at King's College on 6 June 1761 and attempted to observe the transit using a nine-foot refracting telescope. Because of adverse weather conditions they were, in the end, only able to take three sightings of the position of Venus. Reid then read a paper on the transit of Venus to the Society on 14 July 1761, and afterwards kept up on reports of the transit published in the *Philosophical Transactions*. It seems that the preparations for the transit were somewhat fraught for Reid later noted in his *An Inquiry into the Human Mind on the Principles of Common Sense* (1764) that 'in May 1761, being occupied in making an exact meridian, in order to observe the transit of Venus, I rashly directed to the sun, by my right eye, the cross hairs of a small telescope. I had often done the like in my younger days with impunity; but I suffered by it at last, which I mention as a warning to others'.

Thomas Reid as Professor: Glasgow 1764-1796

After Reid moved to the University of Glasgow in the summer of 1764, astronomy again became an avocation since Reid was no longer required to teach the subject. But, if anything, his engagement with the science increased following his move to Glasgow thanks to the stimulus of his new colleague, the Professor of Practical Astronomy and 'University observer', Alexander Wilson (1714-1786), and Wilson's son Patrick (1743-1811), who succeeded his father in the

chair in 1784. Reid also now had access to the impressive set of astronomical instruments owned by the University. The collection of instruments had been built up gradually by successive professors of natural philosophy (Robert Dick *primus* and *secundus*) and then significantly upgraded through the bequest the University received from the wealthy merchant and alumnus, Alexander Macfarlane (*d*. 1755). Macfarlane had acquired a large set of astronomical instruments in order to furnish his own private observatory in Jamaica. In 1755 he gifted his instruments to the University and they eventually arrived by ship in a state of disrepair in October 1756. The arrival of the instruments in Glasgow prompted the University to build an observatory and (in a move that proved to have momentous historical consequences) hired the young instrument maker James Watt to repair Macfarlane's collection. The observatory was completed in 1757 but was little used until Wilson was appointed to the newly founded Chair of Practical Astronomy in 1760. A second set of astronomical instruments to which Reid had access was that owned by the Glasgow Professor of Natural Philosophy, John Anderson (1726-1796), who was popularly known as 'Jolly Jack Phosoporus' both for his dramatic demonstration experiments and his explosive temper. There was thus something of a division of labour at the University, with Anderson teaching physical astronomy as part of his natural philosophy course and Wilson giving private classes on topics related to the practice of observational astronomy like the construction of astronomical tables and the construction and use of instruments.

Although Alexander Wilson had no reputation as an astronomer when he was chosen as the Glasgow Professor of Practical Astronomy, he proved to be a good appointment. He laboured diligently on the improvement of telescopes and his work on sunspots earned him a gold medal from the Royal Academy of Copenhagen in 1771. Wilson was also in contact with William

Herschel, who was given an honorary LLD by the University of Glasgow in 1792. Wilson's suggestion that the solar system and the fixed stars were all moving around some cosmic fixed point was taken up by Herschel and developed in a paper published in the *Philosophical Transactions* in 1783. Wilson himself had earlier published his speculation anonymously in the pamphlet *Thoughts on General Gravitation, and Views thence Arising as to the State of the Universe* (1777).

Patrick Wilson was also an accomplished man of science who, like his father, corresponded with Herschel and the Astronomer Royal, Nevil Maskelyne (1732-1811). The younger Wilson was a close associate of Reid's, as can be seen in the fact that Reid provided letters of introduction when Patrick Wilson went to London in 1772-73. In terms of their shared research interests Patrick Wilson and Reid exchanged ideas regarding the analysis of the aberration of light during the 1770s and 1780s, and Reid devoted a series of substantial unpublished manuscripts to the investigation of the phenomena and its implications.

Reid's surviving reading notes record that he kept up with books published on astronomy, and especially those dealing with observational astronomy. We also know of two instances when he observed significant celestial events. In 1769 Reid, the Wilsons, the Glasgow Professor of Mathematics James Williamson (*d*. 1795), and John Anderson, along with various assistants, observed the transit of Venus that took place in June of that year. According to Alexander Wilson's report published in the *Philosophical Transactions*, Wilson set up two telescopes for his use in 'a house at some distance from our observatory, but in sight of it, and more free from the smoke of the town', while Reid and Williamson worked in the observatory using an achromatic telescope constructed by John Dollond (1706-1761). Also at the observatory Patrick

Wilson used a reflecting telescope made by James Short (1710-1768), and the chemist and botanist William Irvine (1743-1787) manned a 13 foot refracting telescope. Anderson set up his telescope in the college steeple and had to cope with the steeple shaking because it was being buffeted by strong winds. Then, in September 1769, Reid observed a comet which had first appeared in the skies over Europe in early August and which was also observed in China, and in the South Pacific by Captain Cook aboard the *Endeavour* (this comet was catalogued by Charles Messier (1730-1817) as C/1769 P1 and is also known as Napoleon's Comet). Because Reid was not teaching at this point in the year, he was able to stay up through the night for just over a week in order to observe and make notes on the comet. What is not clear from his notes is whether he was making naked-eye observations or using a telescope, and it is also unclear whether he was observing the comet in the observatory or his own private rooms in the University. If the latter, his wife may well have regretted his fascination with the heavens.

Conclusion

In his article of 1981 Ian Stuart does not spell out what his criteria for success and failure are. If we take as our measure of success the meteoric rise of the Edinburgh medical school or the flourishing research traditions in chemistry and geology in eighteenth-century Scotland, then it is true that the study of astronomy in the period was not an unqualified success. But despite all of the problems enumerated by Stuart, Scottish astronomers still managed to do useful and occasionally innovative work in astronomy that was recognized by their colleagues across Europe. In this paper, I have tried to show that the work done by the Scots built on foundations

laid in the seventeenth century by figures like Duncan Liddell and David Gregory of Kinnairdie. I have also tried to show that Scottish men of science were amongst the first in Europe to take up and teach the Newtonian system of the world. The Scots were not as scientifically or culturally backward at the turn of the eighteenth century as Stuart suggests. Thomas Reid's cultivation of astronomy during the various phases of his life well illustrates these points, and his activities in the field of astronomy also point to the vital role played by those who we might regard as 'amateurs' rather than professionals. Even if Scottish astronomers like Reid and his associates were not in the vanguard of those who did most to advance their science in the period, that does not mean that their work was negligible or that astronomy did not figure in the scientific landscape of the Scottish Enlightenment. Eighteenth-century Scottish astronomers succeeded in integrating themselves fully into the European astronomical community and, in doing so, they made a modest but by no means insignificant contribution to the science of astronomy during the course of the Enlightenment.

SUGGESTED FURTHER READINGS

Alexander Broadie (ed.), *The Cambridge Companion to the Scottish Enlightenment* (Cambridge: Cambridge University Press, 2003).

Larrie D. Ferreiro, *Measure of the Earth: The Enlightenment Expedition that Reshaped the World* (New York: Basic Books, 2011).

David Seargent, *The Greatest Comets in History: Broom Stars and Celestial Scimitars* ([New York]: Springer, 2009).

Ian Stuart, 'The Failure of Scottish Astronomy in the Eighteenth Century', *National Newsletter of the Royal Astronomical Society of Canada*, 75 (1981), L21-22, 37-39.

Charles W. J. Withers and Paul Wood (ed.), *Science and Medicine in the Scottish Enlightenment* (East Linton, UK: Tuckwell Press, 2002).

Paul Wood, *The Aberdeen Enlightenment: The Arts Curriculum in the Eighteenth Century* (Aberdeen: Aberdeen University Press, 1993).

Andrea Wulf, *Chasing Venus: The Race to Measure the Heavens* (New York: Alfred A. Knopf, 2012).

The Edinburgh Edition of Thomas Reid, published by Edinburgh University Press, includes scholarly editions of Reid's printed works, his correspondence, and his most important unpublished manuscripts. A selection of Reid's papers on astronomy and the series of manuscripts on the aberration of light mentioned above are included in Volume 9 of the

Edinburgh Edition, *Thomas Reid on Mathematics and Natural Philosophy*, edited by Paul Wood, forthcoming in 2015.