

## HOW SUCCESSFUL WERE QUAKERS AT SCIENCE?

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### ABSTRACT

The impressively high proportion of Quakers in the Royal Society has often been cited to support the claim that Quakers have been far more successful at science than the general population. However, this supporting evidence is shown to be highly problematic and demonstrably false. Moreover, attempts to establish the superiority of Quakers in science have diverted attention away from more interesting and important historical questions.

### KEYWORDS

Quaker scientists, Arthur Raistrick, Hanbury Hankin, Royal Society of London, statistics

Working in the history of science I have frequently encountered the claim that an impressively large number of eminent British scientists were either Quakers or of Quaker descent. In support of this claim several examples have been cited, such as the renowned eighteenth-century doctor John Fothergill, the chemist John Dalton, Thomas Young (who proposed a wave theory of light), Lord Lister (who discovered antiseptis), Sir Arthur Eddington (the astronomer who tested Einstein's special theory of relativity) and the X-ray crystallographer Dame Kathleen Lonsdale. The prominence of science and scientists in Quaker history is also reflected in the Kendal tapestry which includes separate panels illustrating scientists (Dalton, Eddington and Lonsdale), botanists and doctors, while other panels show Quaker participation in such industries as iron smelting at Coalbrookdale.<sup>1</sup> The roll-call of eminent Quaker scientists is certainly impressive, but the mere recital of readily recognizable names—and even some that are less familiar—does not advance the historian's understanding of Quaker participation in science.

1. J.O. Greenwood, *The Quaker Tapestry* (London: Impact Books, 1992).

However, some writers have not only been impressed by the eminent examples cited above but have also claimed that Quakers have been significantly more successful at science than those outside the Quaker community. This claim rests on the analysis of the Fellows of the Royal Society of London, the principal scientific society in Britain, which shows the high proportion of Quaker Fellows when compared with the very small percentage of Friends in the total British population. Indeed, according to one persuasive statistic, first published by E.H. Hankin in the early 1920s, during the latter half of the nineteenth century the probability of election to the Royal Society was approximately 46 times higher, 'if he was a Quaker, or of Quaker descent, than was the case if he belonged to the general population'.<sup>2</sup> Arthur Raistrick, the author of the only extended historical study of Quakers in British science, was even bolder when he asserted that 'Friends have secured something like forty times their due proportion of Fellows of the Royal Society *during its long history*'.<sup>3</sup> This is an impressive figure that clearly identifies Quakers as statistically over-represented within the Royal Society and, by implication, as a religious sect whose members contributed greatly to the advance of science. The initial aim of the present article is to analyse these claims for the period from the foundation of the Royal Society to the year 1900. Finally I will comment on the question that forms the title of this paper.

As a first step we must determine whether fellowship of the Royal Society is an adequate indicator of scientific distinction. Throughout much of the Society's history—the Society was founded in 1660 and obtained its Royal Charter two years later<sup>4</sup>—only a minority of Fellows possessed what we might

2. E.H. Hankin, 'The Mental Ability of the Quakers', *Science Progress* 16 (1921–22), pp. 654–64; H. Hankin, *Common Sense and its Cultivation* (London: Kegan Paul; Trench: Trübner, 1928), pp. 261–67; H. Lyons, *The Royal Society, 1660–1940: A History of its Administration under its Charters* (Cambridge: Cambridge University Press, 1944), p. 115; S. Mason, 'Religion and the Rise of Modern Science', in A. Bäumer and M. Büttner (eds.), *Science and Religion: Proceedings of the Symposium of the XVIIIth International Congress of History of Science* (Bochum: Brockmeyer, 1989), pp. 2–13. However see cautionary note in *The Friend* 68 (1928), p. 405. Other discussions of Quakers in the Royal Society can be found in Anon., 'Friends and the Learned Societies', *Journal of the Friends' Historical Society* 7 (1910), pp. 30–33; A.R. Fry, *Quaker Ways* (London: Cassell, Petter, Galpin & Co., 1933), pp. 214–15.

3. A. Raistrick, *Quakers in Science and Industry, being an Account of the Quaker Contributions to Science and Industry during the 17th and 18th Centuries* (Newton Abbot: David & Charles, 1968), p. 222; emphasis added. This work was first published in 1950. For a recent citation of Raistrick's ratio see D.K. Hurst, *Crisis & Renewal: Meeting the Challenge of Organizational Change* (Boston, MA: Harvard Business School Press, 1995), p. 93.

4. The Society of Friends thus predated the Royal Society by about a decade. Another significant parallel is that both were reformed in the mid nineteenth century.

consider significant scientific credentials, such as having published at least one paper in a respectable scientific journal.<sup>5</sup> During the eighteenth and early nineteenth centuries the Royal Society was widely viewed as a gentlemanly London club and many contemporaries, including a number of accomplished scientists, were highly critical of Society, its President and its Council. Thus in a broadside entitled *Science without a Head* (1830) Augustus Bozzi Granville found that only 16 per cent of the current Fellows had contributed to the Society's *Philosophical Transactions*. Since the vast majority of its members were not scientifically productive Granville declared that the Society was in urgent need of reform.<sup>6</sup> By the second quarter of the nineteenth century a small band of Fellows, Granville included, sought to free the Society from aristocratic patronage and ensure that it and its Council were dominated by practising scientists. Only after the mid-nineteenth-century reform of the admission procedures did the letters FRS (Fellow of the Royal Society) become an increasingly valid indicator of scientific distinction, but even then members of the 'privileged class'—consisting of royalty, peers and Privy Councillors—continued to be elected via a less rigorous route. This was the route followed by the Liberal politician William E. Forster (FRS 1875, who had been disowned by the Quakers in 1850) and the Quaker jurist Edward Fry (FRS 1883), both of whom were Privy Councillors. Although Fry possessed fairly strong scientific credentials and might have secured membership by the normal route, Forster did not. Although many eminent scientists were elected, throughout the period covered by this article membership of the Royal Society should not be taken to indicate scientific eminence.

To appreciate additional problems with the statistic cited above, Hankin's phrase 'a Quaker, or of Quaker descent', deserves examination. First, the lists on which his and subsequent statistics have been based include a number of questionable entries. For example Richard Lower, a seventeenth-century physician, appears not to have been a Quaker despite assisting Quakers and

5. Historical analyses of the Royal Society include M. Hunter, *The Royal Society and its Fellows: The Morphology of an Early Scientific Institution* (Chalfont St. Giles: British Society for the History of Science, 2nd edn, 1994); Lyons, *Royal Society*; M.B. Hall, *All Scientists Now: The Royal Society in the Nineteenth Century* (Cambridge: Cambridge University Press, 1984); R. MacLeod, 'Whigs and Savants: Reflections on the Reform Movement in the Royal Society, 1830–48', in I. Inkster and J. Morrell (eds.), *Metropolis and Province: Science and British Culture 1780–1850* (London: Hutchinson, 1983), pp. 55–90; papers comprising special issue of the *British Journal for the History of Science* 32 (1999), pp. 130–222.

6. A.B. Granville, *Science without a Head; or, the Royal Society Dissected* (London: Ridgway, 1830).

having a brother who was a Friend.<sup>7</sup> Possession of a surname common among Quakers has resulted in other misidentifications. Moreover, the lists compiled by earlier researchers omitted some Fellows who were definitely Quakers. In attempting to provide more accurate statistics I have endeavoured to confirm the religious credentials of FRSs by checking their inclusion in such sources as the Dictionary of Quaker Biography and the lists of births, marriages and deaths (both available in the Library, Friends House, London). The *Annual Monitor* (1813–1920), *The Friend* and the *British Friend* (both founded in 1843) have also proved invaluable for determining who remained within the fold.<sup>8</sup> Yet despite assiduous recourse to these documents I have not always found cast-iron evidence and in a few instances I have had to make informed guesses.

It is generally easier to determine who was elected to the Royal Society, although there are a few problematic cases, including that of William Penn.<sup>9</sup> In a letter to John Aubrey in 1683 Penn conveyed his respects to the Fellows. 'I am a Greshamist throughout', he wrote, indicating his enthusiasm for the Society and its activities.<sup>10</sup> Although he knew a number of Fellows and had probably attended the Society's meetings, Penn was not formally elected. In November 1681 he was proposed for membership by an existing Fellow, John Houghton, but no further steps were taken, presumably because he was then making preparations to sail to America. To complete the admissions procedure he would have had to attend one of the Society's weekly meetings at which the President would have pronounced a formula; he would also have signed his name in the Charter Book. Since he was not formally admitted—nor did he pay his fees—he cannot legitimately be counted as a Fellow. In the ensuing analysis I have also omitted foreign members in order to ensure that the data

7. See *Journal of the Friends' Historical Society* 5 (1908), p. 147.

8. These sources do not substantiate the claims by A. Desmond (*The Politics of Evolution: Morphology, Medicine, and Reform in Radical London* [Chicago: Chicago University Press, 1989], pp. 166–69 and 407) that John Walker and John Epps were Quakers.

9. See list of Fellows in *The Record of the Royal Society for the Promotion of Natural Knowledge* (London: Royal Society, 4th edn, 1940). However, this list should not be taken as definitive as the example of William Penn, who is included, illustrates. Raistrick (*Quakers in Science*, pp. 200–202) and James Walvin (*The Quakers Money and Morals* (London: John Murray, 1997), pp. 116–17) have also claimed that in the middle of the eighteenth century Benjamin Huntsman was considered for membership of the Royal Society. However, I have been unable to find any evidence of either his connection with the Royal Society or that he was a Quaker at the time he was allegedly considered for a fellowship.

10. Letter from W. Penn to J. Aubrey (13/4/1683) in R.S. Dunn and M.M. Dunn (eds.), *The Papers of William Penn* (5 vols.; Philadelphia: University of Pennsylvania Press, 1981–87), II, pp. 394–96. The early meetings were held at Gresham College.

refers to British Fellows, yet I have not been able to take account of the often complex geographical movements of Fellows.

We turn now to the problem of defining 'Quaker descent'. By the beginning of the eighteenth century a high proportion of Quakers were 'birthright Quakers'; that is, both parents were members of the Society of Friends. Yet in each generation the movement attracted some who were not of Quaker parentage and who, following conviction, were accepted into the Society of Friends. These recruits generally accounted for only a small fraction of the total Quaker population and only two of the FRSs included in this analysis converted to Quakerism—Martin Barry (FRS 1840) and William Pengelly (FRS 1863). By contrast, a significant proportion of birthright members was disowned. Although disownment resulted from many causes—such as repeated failure to attend the Meeting, parenting an illegitimate child or breaking with any of a number of Quaker tenets—prior to the reforms of the early 1860s the most frequently cited reason was marriage to a non-Quaker. According to one recent analysis relating to the mid-nineteenth century, 'between a quarter and a third of all [Quakers] who married at all' married out and were therefore disowned.<sup>11</sup> This severe haemorrhage threatened the very existence of the Society of Friends and from 1861 a number of organizational changes were implemented, the most important being the repeal of the proscription against intermarriage. Although it is unclear how wide a definition of 'Quaker descent' (as opposed to membership of the Society of Friends) should be adopted, it would seem reasonable to include only those who had been disowned or resigned their membership.<sup>12</sup> These I shall call ex-Quakers.

The relation of ex-Quakers to the Quaker community is both complex and diverse. Ex-Quakers were not required to subscribe to Quaker tenets and they did not incur the disciplinary procedures to which Quakers were subject. Yet ex-Quakers do not form a homogeneous group since although some firmly rejected their religious upbringing, others remained in close contact with the Quaker movement and even continued to attend meetings of worship. For example, William Forster 'retained the deepest interest' in all aspects of Quakerism and regularly attended Quaker services, after being excluded for marrying Matthew Arnold's daughter. He was even buried in the Quaker

11. E. Isichei, *Victorian Quakers* (London: Oxford University Press, 1970), p. 115. Readmissions were rare and apply to very few of the people discussed in this study.

12. For the schisms and tensions within nineteenth-century Quakerism see Isichei, *Victorian Quakers* and T.C. Kennedy, *British Quakerism 1860–1920: Transformation of a Religious Community* (Oxford: Oxford University Press, 2001).

graveyard near his home in Burley-in-Wharfedale, Yorkshire.<sup>13</sup> Many ex-Quakers, who may outwardly have dissociated themselves from Quaker religious beliefs and even have been baptized into the Anglican Church, sometimes still manifested in their behaviour Quaker habits instilled in their youth. These habits sometimes included a deep interest in science, initially imbibed in a Quaker context.<sup>14</sup> Other ex-Quakers firmly repudiated their upbringing, such as Benjamin Robins whose main scientific contribution was to the thoroughly un-Quakerly subject of gunnery.<sup>15</sup>

Many ex-Quakers joined the Church of England, either for the sake of convenience or because they accepted the Church's tenets. For example, the Irish botanist William Henry Harvey was increasingly attracted to Anglicanism and questioned the Quaker beliefs adopted by his family over several generations. Early in 1841 he praised the Anglican Church for offering a 'calm fixed hope, quietly resting on the very nature of Christianity' and for its doctrinal unity, which contrasted with the schisms that had rocked the Society of Friends during the previous decade. Later that year he claimed that, except for the Quaker rejection of oaths, all the arguments favoured Anglicanism. His religious struggle was resolved by his baptism in February 1846.<sup>16</sup>

Although Anglicanism provided the refuge of many ex-Quaker scientists, some joined other sects and denominations. For example, the meteorologist Luke Howard and his son John Elliot Howard supported the evangelical wing

13. T. W. Reid, *Life of the Rt. Hon. W.E. Forster* (2 vols.; Bath: Adams & Dart, 1970), I, p. 266; II, pp. 551, 566. An obituary notice even appeared as an appendix to the *Annual Monitor* (1887), pp. 207–13, a publication normally reserved for those who died while in connection with the Society.

14. As Hudson Gurney wrote in his memoir of Thomas Young, who had been disowned in 1798 at the age of 24: 'His parents were... [among] the strictest of a sect, whose fundamental principle it is, that the perception of what is right and wrong, to its minutest ramifications, is to be looked for in the immediate influence of a supreme intelligence, and that therefore the individual is to act upon this, lead where it may, and compromise nothing. To the bent of these early impressions he [Young] was accustomed in afterlife to attribute, in some degree, the power he so eminently possessed of an imperturbable resolution to effect any object on which he was engaged, which he brought to bear on every thing he undertook...' [H. Gurney], *Memoir of the Life of Thomas Young, M.D. F.R.S.: with a Catalogue of his Works and Essays* (London: Arch, 1831), p. 6.

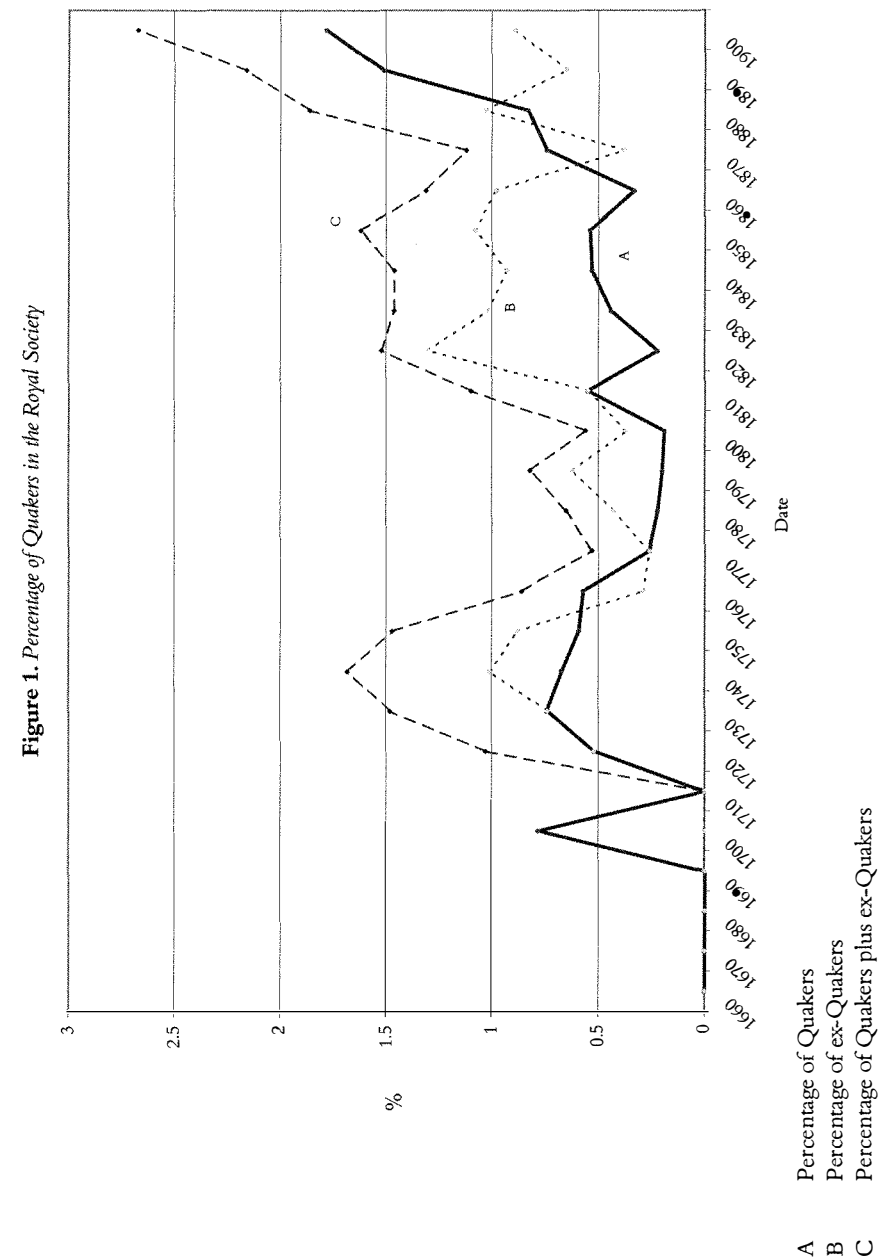
15. W. Johnson, 'Benjamin Robins, F.R.S. (1707–1751): New Details of his Life', *Notes and Records of the Royal Society of London* 46 (1992), pp. 235–52; B.D. Steele, 'Muskets and Pendulums: Benjamin Robins, Leonard Euler and the Ballistics Revolution', *Technology and Culture* 35 (1994), pp. 348–82.

16. Anon., *Memoir of W.H. Harvey, M.D., F.R.S.* (London: Bell & Daldy, 1869), pp. 131–41 and 316.

within Quakerism during the Beacon controversy of the 1830s. After severing their connection with the Friends they joined the Plymouth Brethren.<sup>17</sup> Yet, the break was not complete for although Luke Howard could no longer participate in exclusively Quaker meetings he subsequently took up residence near Ackworth School and continued to be involved in Quaker organizations, such as the Friends' Educational Society. At the other end of the religious spectrum, Unitarianism attracted a significant number of ex-Quakers during the mid-nineteenth century.

Having drawn attention to the problems arising from the phrase 'Quaker, or of Quaker descent' we are ready to confront the cited figure of 46—even Raistrick's 'forty'—for the relative preponderance of Quakers (and ex-Quakers) in the Royal Society when compared with society at large. We shall proceed in two stages. First, the percentage of Quakers among the membership of the Royal Society will be calculated. In Figure 1, Graph A indicates Quakers; Graph B ex-Quakers, and C the sum of Quakers and ex-Quakers. Most strikingly there were no Quaker Fellows prior to 1698, when the merchant Edward Haistwell was elected, and none between his death in 1709 and the election of John Bellers in 1718.<sup>18</sup> Thus Raistrick's claim that the ratio of 40 to 1 applies throughout the Royal Society's 'long history' is clearly false. Moreover, during most of the eighteenth century and much of the nineteenth the proportion of Quakers was small, generally hovering around 0.5 per cent. If ex-Quakers are included a minor peak appears in the middle decades of the eighteenth century, followed by a noticeable decline. During the early decades of the nineteenth century a significant rise in the percentage of ex-Quakers is apparent (B), but this percentage rise is not matched among Quakers (A). Finally, only from the 1870s did the number of Quaker Fellows exceed the number of ex-Quakers—shown by A rising above B. This was probably a consequence of the relaxation of the membership rules in the early 1860s but also relates to the expansion of academic positions, a development to which we shall shortly return.

It is also important to note from Figure 1 that the proportion of Quaker Fellows was not constant but varied significantly over time. In part this variation is due to the small number of Quaker Fellows at any given time, so that when a Quaker was either elected or died, the percentage of Quakers



17. J.H. Kirkwood and C.H. Lloyd (eds.), *John Eliot Howard F.R.S. 1807–1883: A Budget of Papers on his Life and Work* (Oxford: C.H. Lloyd, 1995); Isichei, *Victorian Quakers*, p. 50.

18. G. Cantor, 'Quakers in the Royal Society, 1660–1750', *Notes and Records of the Royal Society of London* 51 (1997), pp. 175–93.

changed abruptly. But longer term variations are also apparent in A, B and C, and these require historical explanation. Thus in the ensuing discussion we need to examine historical changes in both the Royal Society and the Society of Friends.

In the second stage of the analysis I will compare the proportion of Quakers in the Royal Society with the proportion of Quakers in the general population. No attention will be paid to ex-Quakers because of the difficulty of gaining even a rough estimate of their number in the total (or, more exactly, non-Quaker) British population. In determining the number of Quakers I have used the estimates provided by John Rowntree and by the statistical abstracts published in *The Friend*.<sup>19</sup> These sources indicate a slow decline in numbers from the beginning of the eighteenth century until about 1860, after which the Quaker population began to rise. Comparable figures for the non-Quaker population are less easy to determine. For a more precise analysis of both populations we would have had to allow for such variables as age, social class and geographical distribution. For example, since by the mid-eighteenth century most Quakers were middle class, should we compare the Quaker population with only the middle-class fraction of the overall population? Again, Scotland poses an interesting problem, since very few Quakers lived north of the Border. However, I have included Scotland in the overall population figures because it would be very difficult to remove residents of Scotland from the list of Fellows. The issue of gender should also be noted. I have used figures for males in both the Quaker population and in the general population because women were not admitted to the Royal Society during the period under discussion; indeed, the first two women were only admitted in 1945, one of whom was Kathleen Lonsdale. For the general male population figures for England, Wales and Scotland I have used several standard sources.<sup>20</sup>

Population figures—for both Quakers and the general population—are admittedly problematic, especially for the eighteenth century. However, since one of the main aims of this article is to challenge the figures of Hankin and Raistrick, a high degree of accuracy is not required. Moreover, I have not applied the various correction factors that would be needed if a more statistically sophisticated estimate were being attempted. Also, since the number of Quaker Fellows at any time was very small, an overly detailed statistical analysis would be futile.

19. J.S. Rowntree, *Quakerism Past and Present; being an Inquiry into the Causes of its Decline in Great Britain and Ireland* (London: Smith, Elder, 1859); *The Friend* 41, (1901), pp. 522-23.

20. Primarily E.A. Wrigley and R.S. Schofield, *The Population History of England, 1541-1871: A Reconstruction* (London: Edward Arnold, 1981).

Figure 2 shows the proportion of Quakers in the Royal Society compared with the proportion of male Quakers within the population of England, Wales and Scotland. The figures have been calculated for every tenth year, 1660-1900. Since Quakers constituted a very small proportion of the total British population, the ratios shown in this figure will differ only slightly from the ratio of Quaker Fellows to non-Quaker Fellows when compared with the Quaker and non-Quaker populations respectively. In the ensuing discussion this small difference can be ignored.

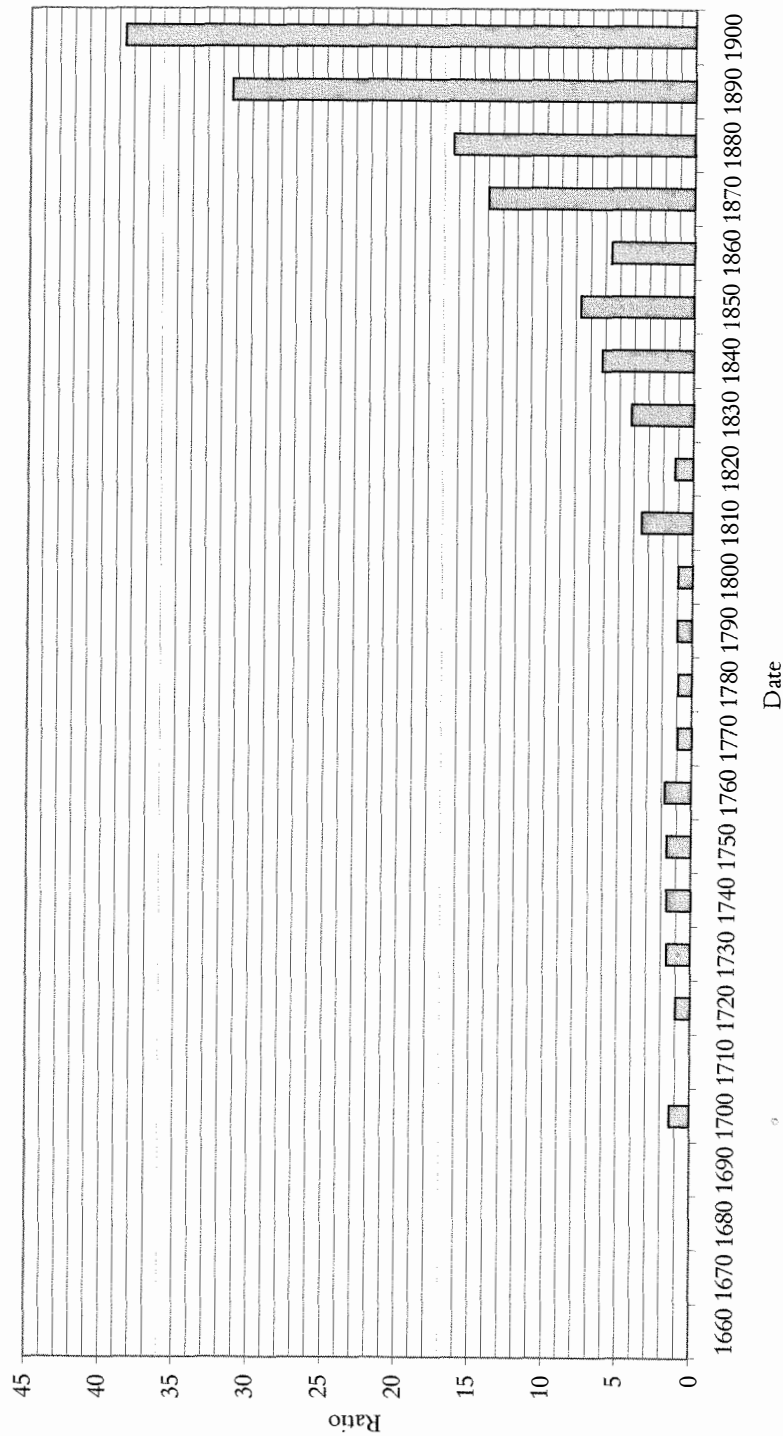
In Figure 2 the ratio of '1' (on the vertical axis) is significant. If the proportion of FRSs in the Quaker community was lower than the proportion of FRSs in the overall (or non-Quaker) population, then the ratio will be less than 1; if the proportion of FRSs was higher in the Quaker community than the proportion in the overall (or non-Quaker) population then the ratio will be greater than 1. Contrary to Raistrick's claim, for the period from the founding of the Royal Society until the 1820s, the ratio was either below 1 or slightly above it. In other words, we should emend his claim to: 'Prior to the mid-nineteenth century Friends did *not* secure...significantly more than their due proportion of Fellowships of the Royal Society.'

Not until the third quarter of the nineteenth century did the proportion of Quaker Fellows rise considerably above the proportion of Quakers in the general population. This increase confirms Hankin's general claim—but not his numerical calculation—that in the second half of the nineteenth century Quakers were significantly over-represented in the Royal Society. This rise was principally produced by several Quaker Fellows who held science positions in the newly founded universities and other institutions that did not operate religious tests. These science lecturers included Daniel Oliver (Durham Medical School and University College London), George Stewardson Brady and Henry Bowman Brady (both Newcastle) and Silvanus Phillips Thompson (Bristol, subsequently Principal of Finsbury Technical College). Eddington, who was appointed to the Plumian chair of astronomy in 1913, was the first practising Quaker to hold a science post at Cambridge.

One other factor deserves brief discussion since it sheds light on the accompanying graphs. The membership and composition of the Royal Society was not constant. The number of Fellows rose steadily throughout the eighteenth century and the first half of the nineteenth, reaching in excess of 750 in the 1840s. Thereafter, in response to a concerted effort by the reformers to ensure that practising scientists dominated the Royal Society, membership fell to about 450 at the century's close.<sup>21</sup> There were also significant changes in the

21. Lyons, *Royal Society*, pp. 341-42; *Record of the Royal Society*, pp. 567-68.

Figure 2. Ratio of Quakers in the Royal Society to Total Population



Society's composition that relate closely to the number of Fellows. As the mid-nineteenth-century reformers complained, many of those who had been elected during the eighteenth and early nineteenth centuries had made no contributions to science and possessed little commitment to it. Instead these unproductive Fellows had joined the Society because of the kudos that accompanied membership. Several of the ex-Quakers included in the calculation for Graph B, Figure 1, probably fell into this category. Following the Society's reform in the late 1840s, solid scientific credentials became increasingly necessary for those seeking election (except those who applied for membership under the 'privileged class' rule). Oliver, Thompson and the Brady brothers, who had all published significant amounts of scientific research, were typical of the ordinary members elected during the closing decades of the nineteenth century.

Whatever the causes of these medium-term variations, the statistics presented above refute the often-cited assertion that Quakers were very strongly represented in the Royal Society throughout the period to 1900. It should also be remembered that Hankin, Raistrick *et al.* cited the strong Quaker presence in the Royal Society as evidence to support their claim that in science Quakers have been significantly more successful than non-Quakers. However, for most of the period under discussion membership of the Royal Society cannot, by itself, be taken as a reliable indicator of scientific success. The question framed in my title—How successful were Quakers in science?—cannot therefore be answered by analysing Quaker representation in the Royal Society.

In conclusion I wish to raise another question. Should historians even try to determine whether Quakers were particularly successful at science? Not only is it difficult—perhaps impossible—to determine the relative success of Quakers in earlier periods, but by focusing on the problem of determining whether Quakers were more or less successful at science than non-Quakers we may be ignoring many historically important issues concerning the Quaker engagement with science. For example, how did Quakers respond to Darwin's theory of evolution? What types of science were offered at Quaker schools? Why were a number of Quakers drawn to careers in horticulture, botanical illustration and botanical publishing?<sup>22</sup> Historical questions like these cannot be answered by concentrating exclusively on the small number of eminent Quaker scientists, such as Dalton, Eddington and Lonsdale. Instead not only should the lives and work of many lesser-known Quakers be explored but we

22. For attempts to engage these issues see G. Cantor, 'Aesthetics in Science, as Practised by Quakers in the Eighteenth and Nineteenth Centuries', *Quaker Studies* 4 (1999), pp. 1-20; *idem*, 'Quaker Responses to Darwin', *Osiris* 16 (2001), pp. 321-42.

also need to assess the place of science within the broader social and religious history of Quakerism. In following these lines of research the historian will no longer see the question at the head of this paper as particularly relevant. Indeed, that excessively dominant question, together with the conventional answer articulated by Raistrick, have acted as impediments to historical understanding.

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