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(*b.* Woburn, Bedfordshire, United Kingdom, 24 September 1766, *d.* London, United Kingdom, 6 January 1826),

geology, music, mathematics.

For the original article on Farey see *DSB*, vol. 4.

Farey has left a difficult legacy for those who follow him. First, he was a true polymath. His initial training was as a land surveyor. But from 1803, he pursued the entirely new profession of mineral surveyor (a term Farey invented in that decade). Farey also made significant contributions as an engineer, mathematician, musician, and geologist. Anyone trying to investigate him in the early twenty-first century should be impossibly as polymathic as he was; this has certainly not been the case in mathematics. Here, the famous, misinformed assessment of 1940, by the academic Godfrey Harold Hardy, was that “Farey is immortal [only] because he failed to understand a theorem which Haros had proved perfectly fourteen years before” (Hardy, 1940, pp. 21–22). Second, unlike Charles Darwin (to give only one famous example), Farey failed to leave any significant personal archives after his death, and thus all explorations of Farey’s multiplicity of activities (and frustrations) have been made much more difficult. Another important consideration, within the worlds that Farey occupied, was that he was dependent on commissions. As he wrote in 1816, “my circumstances in life, and the state of the Times, less and less permit my indulging in any pursuits which do not make some return towards the support of my family. For several years past Mineral Surveying & Engineering have been my only dependance & source of Profit (except now and then writing a little for the periodical press and a trifle from the Smithfield Club)” (Farey, 1816). Farey had been appointed to the Smithfield Club in 1806, as paid secretary (£30 per year) and, from 1815, additionally as treasurer (£40 per year). He never enjoyed any regular salary or academic support.

Early Years and Interests . Farey was born on a farm of the fourth Duke of Bedford, tenanted by his parents, [John Farey](#) (1728–1798) and his second wife, Rachel Wright (1732–1804), who was a Wesleyan Methodist. After normal village schooling, Farey was sent in 1782 to the academy run by Robert Pullman in Halifax, Yorkshire. Farey studied drawing and surveying under this “studious man and good mathematician,” who gave him “gratuitous instruction in mathematics and [natural] philosophy” and brought him to the attention of engineer [John Smeaton](#). By 1785, Farey was based in London. This training stimulated Farey’s first interest, in mathematics, which remained a hobby throughout his life. Between at least 1797 and 1811, Farey contributed many mathematical propositions and answers to journals such as the *Gentleman’s Diary*, *Gentleman’s Mathematical Companion*, and *Leybourn’s Mathematical Repository*.

On 10 May 1790, Farey married Sophia Hubert (1770–1830) at St. Pancras Church, London. Both Fareys were soon also active as musicians, John as a tenor and Sophia as a soprano, in the Choral Fund, Cecilian Society, Surrey Chapel Society, and in singing oratorios at [Drury Lane](#). John was also the first secretary and librarian to the Choral Fund, founded in 1791, “for the relief of decayed musicians, their widows and orphans” (Choral Fund, 1807). He soon became the country’s expert on the theory of musical intervals, work that used his mathematical abilities. These musical interests arose directly from his mathematical work. Farey achieved a homonymous fame in mathematics in 1816, with his publication on “a curious property of vulgar fractions,” soon named Farey Numbers. Using the continued fractions methods that he had established for his musical work, Farey showed the properties of such fractions when arranged in order. The fifth Farey series was, for example:

1 1 1 2 1 3 2 3 4

5 4 3 5 2 5 3 4 5

Such series proved to have many interesting arithmetical properties, because, if a/c and b/d are consecutive fractions in such a series, then the multiplied products $a \times d$ and $b \times c$ prove consecutive integers. They are best expressed graphically by Ford Circles. Farey, although the first to bring such properties to public attention, was not the first to recognize them, and lacking financial support, he never offered any proof. Further study of his mathematical work may reveal more.

Farey and Geology . In 1792, Farey was appointed, by Francis Russell, fifth Duke of Bedford, as land steward to Russell’s extensive Bedfordshire estates. He thus returned to his birthplace and threw himself into the practice and study of agriculture. At the 1798 Woburn sheep shearing, Farey first met his future patron [Sir Joseph Banks](#), president of the [Royal Society](#), and showed Banks his work on improving the drainage at Woburn, which had first been planned by Joseph Elkington. Farey was encouraged by the duke to study methods of drainage. Another figure who was involved in trying to correct the drainage problems at Woburn, which Elkington had failed to master, was, from July 1801, the land and mineral surveyor and engineer

[William Smith](#), who was later called the “father of modern English geology.” Farey and Smith met in October 1801; they went on tour together late in 1801 and again early in 1802, along with Farey’s friend and fellow mathematician, the local Leighton Buzzard brewer and later engineer, Benjamin Bevan (1773–1833), of the Bevan Point in geometry. This was an 80 kilometer (50 mile) round trip to investigate the local strata. Smith had already realized from 1795 around Bath, Somerset, that such strata could be ordered in sequence and then identified from the fossils they often contained.

A first outcome of this connection was the support Farey and Bevan both gave to the suggestion, in April 1803, that a new society be formed to gather “scientific information.” Bevan immediately supported this, and hoped it might foster relations with other existing organizations, such as the British Mineralogical Society, the London Philosophical Society, or the Royal Institution. Farey joined the debate in November 1803, writing to the *Monthly Magazine*’s publisher, Richard Phillips, asking to be placed on the list of correspondents “as an enquirer in the subjects of Agriculture, Mechanics, Mineralogy, Meteorology, to which I would add, should the Society embrace those objects, Geology, Engineering, Mathematics, Music (theory of its intervals), Rural Improvements and Stewardship of Estates.” That no more was heard of this society was only one result of the appalling political situation in Britain, after the Peace of Amiens had collapsed, in 1803. This is a reminder that the critical years of Farey’s several careers were during Napoleonic wartime, when international scientific communications suffered badly and there were national economic difficulties that caused Farey, and Smith, real financial problems.

Farey had been studying geology before he met Smith, but he was now so impressed by both the novelty and importance of Smith’s knowledge of stratification and how fossils could be used that he wrote at length to Banks, reporting on Smith’s discoveries in February 1802. But on 2 March 1802, his patron the Duke of Bedford died. This proved a most “severe blow to Smith [and Farey]’s prosperity.” The duke’s brother, John (1766–1839), who inherited his enormous estates, dismissed Farey in June, after nearly ten years service, during which £717,800 had passed through Farey’s agency in more than half a million transactions.

New Employment . Farey suddenly had to find new employment. His first thought was to take up farming, but instead he settled at 12 Crown Street, Westminster, London, earning his living as a land surveyor and as a pioneering mineral surveyor. In 1805, Farey started as a frequent, if anonymous, contributor to Abraham Rees’s important *Cyclopaedia*, on “canals, geology, measures, music and trigonometrical survey.” In 1806, he started another long series of publications on music, becoming an enthusiastic advocate of equal temperament tuning, using instruments on which such alternative temperaments could be demonstrated. In 1811, after a dispute with Rees about his geological contributions, he stopped writing for him, even on music, at the end of the volume I/J. Farey was replaced on geology by the German-born and Wernerian-influenced curator at the [British Museum](#), Charles Koenig. Farey’s musical work for Rees had comprised all the more theoretical and mathematical articles dealing with temperaments, tuning, and harmonics. Farey was soon active again, between 1810 and 1819, as a contributor to the rival *Edinburgh Encyclopaedia*, again largely contributing on music.

In 1804, Farey and Smith together attended the Woburn sheep shearing, at which Banks opened a subscription to support the publication of Smith’s planned geological map, or *Delineation of the Strata of England and Wales*. By May 1806, Banks wanted this completed, so Farey, while reporting this to Smith, threw his energies into encouraging and publicizing Smith’s geological results, and demonstrating their importance, in the *Monthly Magazine* and *Philosophical Magazine*, and [William Nicholson](#)’s *Journal*. Banks now commissioned Farey to prepare a stratigraphic cross section between London and Brighton. Farey’s brother conveniently worked in Sussex at the time. In September 1806, Farey visited trials to find coal being made at Bexhill, Sussex, by the later railway pioneer [William James](#) and immediately realized the impossibility of their success, like those of the many other searches then being made for wartime coal in such impossible stratigraphic situations. Farey tried unsuccessfully to point out the enormous sums of money that such trials must waste. By early 1807, this enormous section was finished. His was the first detailed cross section to be prepared in England, and it correctly showed for the first time the denuded, anticlinal or “strata-ridged” (as Farey called it), structure of [the Weald](#). Farey prepared several other stratigraphic sections across many other parts of England, but all remained unpublished in his lifetime.

Derbyshire Commissions . The year 1807 brought Farey two new commissions, in Derbyshire, to the even more peripatetic Smith’s great frustration, who was hoping such commissions would come to him. Farey now also advertised his services as a “mineralogical surveyor,” for, as Banks wrote to France in 1811, “we have now some Practical men well versed in stratification who undertake to examine the subterranean Geography of Gentlemens Estates in order to discover the Fossils likely to be useful for Manure, for fuel etc.” [De Beer, 1960, p. 191]. The first task was to survey the county for Sir John Sinclair’s Board of Agriculture. The result was Farey’s best-known work, his detailed, three-volume *General View of the Agriculture and Minerals of Derbyshire* (1811–1817). This work includes a pioneering analysis of the geometry of faulting and an early discussion of English strata. The other commission, privately for Banks, was a detailed geological survey of Banks’s own mineral-rich Overton estate, near Ashover. This was finished by 1812, but plans to publish it in the *Transactions of the Geological Society of London* were aborted in 1813 when it was found too minute and detailed. Many in that society still remained to be persuaded of the reliability and novelty of Smith’s and Farey’s methods. But enough fragments of Farey’s Ashover survey have survived, in the Sutro Library, [San Francisco](#), California, to demonstrate how extraordinarily advanced his geological field mapping skills then were. It has been rightly said of this map, “if one did not know the date, one might easily suppose by its appearance that the map was a late nineteenth-century production” (Oldroyd, 1996, p. 114).

Last Years . Farey became a leader in the new field of mineral surveying and was active all over the [British Isles](#), preparing reports on Yorkshire alum and coal, Edinburgh water, Borrowdale graphite, North Wales slates, and coal throughout Scotland and the Welsh borders. In 1814, he raised his charges from 2 to 3 guineas per day, plus expenses. But he was never able to

publish these private *Reports*, which he had gathered with this intention. They remained in manuscript and were as of 2007 mostly lost. The end of the [Napoleonic Wars](#) immediately had a devastating effect on such commissions and on sales of Smith's map published at last in 1815. Smith was rewarded with time in a debtors' prison in 1819, and, by 1824, Farey was reduced to offering himself as copyist to the Sowerbys, a family of natural history authors and publishers, at one shilling per hour.

Up to 1813, Farey had given inadvertent but vital help to the Geological Society's rival *Geological Map*, published in 1820, five years after Smith's. Farey was subsequently ostracized by this society (of which neither he, nor Smith, were ever elected members), despite W. H. Fitton's attempted mediation in 1817–1818, and so, by 1822, Farey could refer to the society as “the Anti-Smithian Association.” Farey had been unjustly marginalized by the ruling elite of English geology (based at the newly founded [1807] and gentlemanly Geological Society of London) from 1811, when his writing for Rees's *Cyclopaedia* was terminated. Many of Farey's papers had now to be published under the cloak of anonymity as by “A Constant Reader.” Nevertheless, Farey continued to publish to an extraordinary extent. More than 270 items have come to be identified, over an amazing range of subjects, also including astronomy (long another interest), engineering, politics, and pacifism. They range from supporting Thomas Malthus in 1804, urging that English currency be decimalized in 1817, to leading the campaign against counterfeiters of [Bank of England](#) notes (*Times*, 21 April 1820, p. 3).

Farey's many geological writings provide a fine view of the highly political battles then raging between the gentlemanly geologists of the Geological Society and the working practitioners, such as himself and Smith. Farey rightly felt that the latter had made much the most important contribution to the task of unravelling British strata. Farey died, following a stroke, at 37 Howland Street, London, where he had moved early in 1816; he was buried in St. James Church, St. Pancras. His widow, Sophia, tried in vain to sell his enormous geological collections to an uninterested [British Museum](#) in 1828, but these, like his extensive manuscript collections, afterward disappeared. Their eldest son, [John Farey](#) (1791–1851), built a reputation as one of the finest consulting engineers in England, while others of the Fareys' seven surviving children emigrated to France and the [United States](#).

Conclusion . Farey was a man of enormous industry and of high principles, always determined to give credit where he thought it due (as to [William Smith](#)) but equally ready to deny it (as to road maker J. L. McAdam, whom he thought unoriginal). Farey was one of the first to claim that geological knowledge was of real economic importance in Britain's rapid industrialization and to demonstrate how such knowledge could and should be applied. But in such a laissez-faire and war-torn society, getting that message heard had proved a very difficult task.

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