

Sir George Biddell Airy Papers
1840-1890
Mss.B.Ai7p

American Philosophical Society
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Summary Information

Repository	American Philosophical Society
Creator	Airy, George Biddell, Sir, 1801-1892
Title	Sir George Biddell Airy Papers
Date [inclusive]	1840-1890
Call number	Mss.B.Ai7p
Extent	0.25 Linear feet Ca. 40 items
Location	LH-MV-C-1; LH-MV-E-1 (OS)
Language	English
Container	1
Abstract	<p>The collection is divided into two series. The first contains disparate letters from Airy relating to his publications and his position as Astronomer Royal of England, with mentions of topics such as: electrical experiments, magnets, Observatoire de Paris, stars, and telescopes. Correspondents in this series include: Edward Wedlake Brayley, James Challis, Alexander S. Herschel, Balfour Stewart, Septimus Tebay, John Washington. The second series features a group of documents put together by George May of the Harton Colliery at South Shields (1889) relating to Airy's pendulum experiments at Harton Pit in 1854 to measure the density of the earth.</p>
Preferred Citation	Cite as: Sir George Biddell Airy Papers, American Philosophical Society.

Background note

Sir George Biddell Airy (1801–1892) was a British astronomer. Airy became Lucasian Professor of mathematics at Cambridge in 1826 and Plumian Professor of astronomy and director of the new Cambridge Observatory in 1828. From 1835 to 1881, he served as Astronomer Royal, a senior post in the Royal Household of the Sovereign of the United Kingdom.

Airy was born in Northumberland, England, to William Airy and Ann Biddell. His father was a tax collector, but he lost his position by the time young Airy was thirteen. As a result, the boy came under the care of his uncle Arthur Biddell, who supported George's growing interest in science. In 1819, Airy enrolled at Trinity College, Cambridge. Even though he attended on a reduced fee, he had to support himself with taking on pupils. Airy distinguished himself as a disciplined and talented student. Among other honors, he graduated as the top First Class student in 1823. He was also awarded a fellowship at Trinity College where he commenced his academic career.

Airy made many contributions in mathematics, physics and astronomy. One of his first research interests was the achromatism of eyepieces and microscopes. After discovering astigmatism in one of his own eyes, he suggested a successful method for correcting it by using a concave lens with one or two cylindrical surfaces. He also discovered the Airy stress function method, which helps determine strain and stress fields within a beam, and the Airy Wave theory, which describes gravity waves on the surface of a fluid. In addition, he also investigated the mass of Jupiter. One of his most significant accomplishments as an astronomer was the discovery of a new inequality in the motions of Venus and the Earth. For this he received the Gold Medal of the Royal Astronomical Society in 1832.

In 1836, Airy became the Astronomer Royal. He immediately concentrated his efforts on improving the equipment and to reform the procedures and methods by which the Greenwich Observatory had been run until then. The first of the new instruments, an altazimuth designed primarily to observe the moon, was installed in 1847. Among the other equipment, most of which was designed by Airy himself, were a new meridian circle, a new equatorial, a double-image micrometer. Under his direction, observations were made with uninterrupted regularity. The editor of his autobiography noted that the "ruling feature of his character was undoubtedly Order." This trait was clearly reflected in his extremely methodical and accurate reports, including the data he made available to the public. In 1851, he suggested the location of the Royal Observatory at Greenwich as the location of the Prime Meridian.

One of Airy's important accomplishments was measuring the mean density of the Earth. In 1826 he launched a series of pendulum experiments at the top and bottom of deep mines. In 1854 after several failed efforts due to accidents and flooding, Airy tried the experiment at the Harton pit near South Shields, a coastal town in northeastern England. He was able to show that gravity at the bottom of the mine exceeded that at the top. From this he was led to the final value of Earth's specific density.

In the mid 1840s, Airy's reputation was tarnished by his hesitancy to search for a planet, whose existence had been predicted by other astronomers, including the French mathematician Urbain Jean Joseph Le Verrier. Le Verrier based his claims only on mathematics and astronomical observations of the known planet Uranus. By the summer of 1846, leading astronomers in France and Germany were systematically

searching for the body. Airy resisted joining the race, even after Cambridge astronomer John Couch Adams also predicted that there existed an unobserved planet. On July 9, when Airy finally launched a search, it was too late: the planet Neptune was discovered on September 23, 1846, by Johann Gottfried Galle at the Berlin Observatory. News of the discovery triggered a heated contest over the allocation of credit as well as blame for those who had failed to search more energetically. Airy in particular was severely criticized; he wrote later that he “was abused most savagely by the English and French.” He defended himself with the argument that the search for a planet was not the role of the Greenwich Observatory. Moreover, he had actually tried for several months in 1845 and 1846 to convince another British astronomer, James Challis, his successor as Plumian Professor at Cambridge and head of the University Observatory, to look for the unseen planet. Finally, some recent scholars have suggested that Airy’s obsession with order and dread of alteration of routine, coupled with a strong sense of duty as a public employee who should not spend taxpayers’ money on such “non-utilitarian” projects, may help explain his reluctance to launch a search.

The “loss to England and to Cambridge of a discovery which ought to be theirs every inch of it,” as the British mathematician and astronomer Sir John Herschel put it in November 1846, cast a long shadow over Airy’s career. Nevertheless, over the course of his life, Airy received numerous awards and honors for his work in mathematics, physics and astronomy. In addition to the Royal Astronomical Society’s Gold Medal, which he won twice, he was awarded the Copley Medal from the Royal Society (1831), and the Lalande Prize from the French Academy of Sciences (1834). He was made a Knights Commander of the Order of the Bath in 1872; shortly afterwards, he was knighted by the Queen.

Airy was married to Richarda Smith. They had nine children, seven of whom survived to adulthood. His son Wilfrid Airy was the designer and engineer for the telescope and its equipment in George Tomline’s Orwell Park Observatory. He edited his father’s autobiography, which was published in 1896, four years after Sir George Biddell Airy’s death.

Scope & content

The collection is divided into two series. The first contains disparate letters from Airy relating to his publications and his position as Astronomer Royal of England, with mentions of topics such as: electrical experiments, magnets, Observatoire de Paris, stars, and telescopes. Correspondents in this series include: Edward Wedlake Brayley, James Challis, Alexander S. Herschel, Balfour Stewart, Septimus Tebay, John Washington. The second series features a group of documents put together by George May of the Harton Colliery at South Shields (1889) relating to Airy's pendulum experiments at Harton Pit in 1854 to measure the density of the earth. They include letters, pamphlets, and a piece of wire used for the pendulum experiment.

Administrative Information

Publication Information

American Philosophical Society 2006

Provenance

Acquisition Information

Initial accession, 1974. Harton Colliery manuscripts (B\Ai7p.1) purchased from William Allen (\$950.00) and accessioned, 12/20/1983 (1983 1644ms). See in-house shelf list for additional accession dates and numbers.

Processing Information

Recatalogued by RWS, 2006.

Indexing Terms

Genre(s)

- Clippings.
- Scientific Correspondence

Subject(s)

- Artifacts
- Astronomy - Research - England
- Beyond Early America
- Electricity - Experiments
- Geology - Research - England
- Geology, Structural
- Magnetism - Experiments
- Magnets
- Observatoire de Paris

- Pendulum
- Science and Technology
- Stars -- Magnitudes.
- Telescopes

Other Descriptive Information

The collection consists of approximately forty letters Airy wrote to various correspondents. The topics of his letters reflect the wide-range of his intellectual and scientific interests, touching on magnetism, electricity, telescopes, and solar observations. Many letters include Airy's opinions on scientific instruments, essays, and theories. The collection has a significant amount of information from Airy's attempt to determine the Earth's density using pendulums and telegraph technology at a mine in Harton in 1854. Included in this portion of the collection are artifacts, drawings, and diagrams from the experiment, and the subsequent letters and lectures Airy wrote about the experiment itself.

The bulk of the collection is beyond 1850.

Biography of Primary Contributor(s): Sir George Biddell Airy was a leading British astronomer in the nineteenth century. Airy was raised in humble surroundings in Northumberland, England. At an early age, Airy's intelligence attracted the notice of his teachers, and he received numerous scholarships to advance his studies, eventually earning a scholarship to Cambridge University. Upon graduation, Airy was offered a position at Cambridge. Airy had become an expert in optics and sealed his reputation in the field when he published *Mathematical Tracts on Physical Astronomy* in 1826, three years after graduating. The work earned him the Lucasian chair. Two years later, he was promoted to the Plumian professorship.

In 1835, Airy secured the position of royal astronomer, a position he would hold for forty-six years. During his tenure, Airy played a central role in a number of important and wide-ranging scientific events and discoveries. He successfully secured Greenwich as the zero meridian, helped confirm the existence of solar prominences, worked to determine the effect of iron hulls have on ship's magnetic compasses, and authored the definitive work on lunar and solar events from 1750-1830, a work that helped generations of scientists.

Other Descriptive Information

This manuscript collection falls outside the geographic scope of the Early American guide (British North America and the United States before 1840). It may be of interest to scholars interested in global history, international relations, imperialism, or the U.S. in the world.

Series I. Miscellaneous correspondence

Collection Inventory

Series I. Miscellaneous correspondence	1840-1869	
Airy, George Biddell, Sir, 1801-1892	1840 August 29	A.L.S. 1 p.
Letter to the Dean of Ely, Greenwich.		
Asks for instructions, recommendations, etc., for coal fields, cathedrals, etc., he may visit as he travels to Glasgow via Durham.		
Airy, George Biddell, Sir, 1801-1892	1842 August 30	A.L.S. 3 p.
Letter to J. Cranch, Greenwich.		
Discusses the procuring and setting up of a telescope. Mentions the Paris observatory, E.J. Cooper, J. South, R.A. Cauchoix, W. Simms, E. Troughton, G. Dollond.		
Airy, George Biddell, Sir, 1801-1892	1849 December 6	A.D.S. 1 p. Sketch with written explanation.
List of materials wanted for a model.		
Concerns an electrical experiment.		
Airy, George Biddell, Sir, 1801-1892	1850 September 24	A.L.S. 2 p.
Letter to "Dear Sir," Royal Observatory, Greenwich.		
Has been home and not had the opportunity to answer note of Sept. 2 delivered by W. Welsh. Operations in regard to transfer of or cooperation in electrical matters depends on Kew Committee. Mentions Col Sykes. Magnetic Instruments.		
Airy, George Biddell, Sir, 1801-1892	1852 November 25	A.L.S. 4 p.
Letter to [James] Challis, Greenwich.		
Reports on an Adams Prize Essay which he finds very unsatisfactory. A critique given, suggests that prize be deferred a year. Concerns astronomy. Mentions Prof. Miller.		

Series I. Miscellaneous correspondence

Airy, George Biddell, Sir, 1801-1892 1853 March 7 A.L.S. 4 p.
 Letter to E[dward] W[edlake] Brayley,
 Royal Observatory, Greenwich.

Has referred to Baily's pamphlet. Discusses correction to the motion of the node. Mentions Leplace, Bouvard, Seyffarth. With regard to connection of science and lit., mentions his study of place of Julius Caesar's landing in England.

Airy, George Biddell, Sir, 1801-1892 1857 February 16 A.L.S. 1 p.
 Letter to Captain [John] Washington,
 London.

Plans to go to Ipswich to inspect instrument casting, but will delay journey in event of visit by Mr. De la Marche.

Airy, George Biddell, Sir, 1801-1892 1858 August 17 A.L.S. 1 p.
 Letter to S[eptimus] Tebay, Royal
 Observatory, Greenwich.

Gives formula for interfering of light waves. "...even then they would be seen as perfectly separate in a general view of space,..."

Airy, George Biddell, Sir, 1801-1892 1863 March 17 A.L.S. 2 p.
 Letter to Alexander S. Herschel, London.

Comments on reliability of B.A.C. as regards star magnitude (possibly Baily's Astronomical Collection, 1827) and competence of B.A.C. editor [Francis] Baily. Mentions Argelander.

Airy, George Biddell, Sir, 1801-1892 1863 October 21 A.L.S. 4 p.
 Letter to Balfour Stewart, Royal
 Observatory, Greenwich.

Details for treatment of magnetic observations in respect of the influence of disturbances. Discusses astronomical observations made at Maherstown.

Airy, George Biddell, Sir, 1801-1892 1864 September 16 A.L.S. 4 p.
 Letter to [James] Challis, Greenwich.

Series I. Miscellaneous correspondence

Concerns questions submitted to Airy by Challis, for the Sheepshank Scholarship. Airy comments and makes suggestions. Concerns astronomy. Mentions Wilkinson.

Airy, George Biddell, Sir, 1801-1892 1869 November 1 A.L.S. 2 p.
Letter to [James] Challis, Greenwich.

Concerns magnets. Airy sending results of experiment involving the "direction given by a large magnet to a small one."

Airy, George Biddell, Sir, 1801-1892 n.d. A.D. 2 p.
Review of unidentified book.

Discusses formation of earth's crust and composition of earth's interior, displacement of mass. Mentions Archdeacon Pratt.

Series II. Pendulum experiment material

Mss. B Aip7.1 Series II. Pendulum experiment material
1854-1890

Includes approximately 26 letters between Airy and the mine owners, C. W. and William Anderson. Airy gives instructions and draws diagrams both before and during the experiments, and there are subsequent letters seeking information needed for additional calculations. Included are news clippings, a pamphlet by Airy (Lecture on the Pendulum-Experiments at Harton Pit. London, 1855), and a piece of the wire used in the experiment.

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 11
to C.W. Anderson

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 12
to C.W. Anderson

Anderson, C.W. 1854 Aug. 13
to [Airy]

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 14
to C.W. Anderson

Anderson, C.W. 1854 Aug. 18
to Airy

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 22
to C.W. Anderson

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 29
to C.W. Anderson

Airy, George Biddell, Sir, 1801-1892 1854 Aug. 29
to C.W. Anderson or W. Hartley

Anderson, C.W. 1854 Aug. 29
to Airy

Airy, George Biddell, Sir, 1801-1892 1854 Sept. 6
to C.W. Anderson

Series II. Pendulum experiment material

Anderson, C.W. to Airy	1854 Sept. 7	
Airy, George Biddell, Sir, 1801-1892 to C.W. Anderson	1854 Oct. 18	
Airy, George Biddell, Sir, 1801-1892 to W. Anderson	1854 Oct. 18	
Illustrated London News "The South Shields Pendulum Experiments by the Astronomer Royal," p. 445-448	1854 Nov. 4	Oversize
Airy, George Biddell, Sir, 1801-1892 to W. Anderson (2 copies)	1854 Nov. 29	
Anderson, C.W. to Airy	1854 Nov. 30	
Newspaper clippings relating to pendulum experiments	[1854]	
Airy, George Biddell, Sir, 1801-1892 to William Anderson	1855 Jan. 2	
Anderson, C.W. to Airy	1855 Jan. 4	
Airy, George Biddell, Sir, 1801-1892 to C.W. Anderson	1855 Jan. 8	
Airy, George Biddell, Sir, 1801-1892 to James Mather	1855 Jan. 10	
Anderson, C.W. to Thos. Crawford	1855 Jan. 10	
Airy, George Biddell, Sir, 1801-1892	1855 April 27	

Series II. Pendulum experiment material

to C.W. Anderson

Anderson, C.W. 1855 May 2
to Airy

Anderson, C.W. 1855 May 16
to Airy

Airy, George Biddell, Sir, 1801-1892 1855 Aug. 24
to C.W. Anderson

Airy, George Biddell, Sir, 1801-1892 [1855] Printed
Lecture on the Pendulum Experiments at pamphlet, 26
Harton Pit, Delivered in the Central Hall, p.
South Shields, October 24, 1854.

Anderson, C.W. 1856 June 17
to Airy

Garnett, William 1890 April 23
to George May

List of participants in pendulum n.d.
experiment?

Wire used by Professor Airy in his n.d.
pendulum experiments at Harton Colliery.
