

MARY SOMERVILLE

By ELIZABETH C. PATTERSON

"WHATEVER difficulty we might experience in the middle of the nineteenth century in choosing a king of science", read the obituary notice in *The Morning Post* of Monday, 2 December 1872, "there could be no question whatever as to the queen of science."¹ And in a full-length column the death in Naples on the preceding Friday of Mary Somerville was announced. *The Times* of the same date, in a notice² of equal length and somewhat more scientific detail, spoke of the high regard in which her services to science were held both by men of science and by the nation. She had been for almost half a century the most famous of English scientific ladies and in achieving that role had become the first scientific lady of the world.

The purposes of this paper are (i) to sketch her career, now fallen into obscurity as, with the passage of time, she has moved from a place of eminence to one of a mere curiosity; (ii) to indicate briefly the usefulness of an investigation of that career as a source of material about nineteenth-century science in England, on the Continent and in America; and (iii) to give some idea of the contents of the Somerville papers³ which the author has examined.

Among nineteenth-century autodidacts Mary Somerville may well be, to twentieth-century eyes, the most remarkable. Born at a time when the education of women was often held needless and even abhorrent, when opportunities for it were infrequent and limited, and at an age in life when—then, and even more markedly today—one's career is apt to be considered fixed and nearing culmination, she began a vigorous self-education in mathematics and science that led to a productive professional career almost fifty years long. At the time of her death, a month short of her ninety-second birthday, she had recently completed the second edition of her fourth and last scientific book and was revising a mathematical treatise.⁴ Certainly no other scientific lady of the times—Mrs. Jane Marcet,⁵ Caroline Herschel,⁶ or Maria Mitchell⁷—ever considered

¹ *The Morning Post*, London, 2 December 1872.

² *The Times*, London, 2 December 1872.

³ The Somerville Collection, deposited by its owner, Sir Brian Fairfax Lucy, at Somerville College and the Bodleian Library.

⁴ She had begun the treatise, "On the Theory of Differences", some forty years earlier.

⁵ Mrs. Jane Haldimand Marcet (1769-1858) wrote *Conversations on Chemistry* (1806), *Conversations on Political Economy* (1816), *Conversations on Natural Philosophy* (1819)—all of which passed through numerous editions—and children's stories. She married in 1799 Dr. Alexander Marcet, F.R.S., chemist, discoverer of xanthine and collaborator with Berzelius. An affectionate friendship existed between Mrs. Marcet and Mrs. Somerville from the time of their meeting in 1817. *Conversations on Chemistry* was the most popular elementary chemistry book in Great Britain and the United States for more than 30 years. Faraday as a lad of 18 encountered the

(Footnotes 5, 6 and 7 continued at foot of next page.)

herself Mrs. Somerville's equal, and in this view they agreed with their contemporaries.⁸

Mary Somerville was born Mary Fairfax at Jedburgh just inside the Scottish border on 26 December 1780, the only daughter of Lieutenant William Fairfax (later Admiral Sir William Fairfax, hero of Camperdown) and Margaret Charters, daughter of the Solicitor of Customs for Scotland, Samuel Charters of Edinburgh. The Fairfaxes, originally a Yorkshire family,⁹ are linked with several distinguished soldiers and sailors, including the Parliamentary general, Lord Thomas Fairfax,¹⁰ and the American leader, George Washington.¹¹ The William Fairfax family—two sons and a daughter—lived with great simplicity and greater economy at Burntisland,¹² across the Forth from Edinburgh—their father absent for long periods on naval duty and their mother, though like him loving and kindly, opposed to needless learning for anyone, and especially for young females. Mary grew up in the freedom of a hearty outdoor life, which fostered a robust constitution and an abiding interest in and love of plants and

⁸ "Mary Somerville probably has no rival among women as a scientific scholar," Justin McCarthy, *A History of Our Own Times*, new edition (London, 1882), ii, 244.

⁹ Martha Somerville (ed.), *Personal Recollections from Early Life to Old Age of Mary Somerville* (London, John Murray, 1874), 6.

¹⁰ Lord Thomas Fairfax was a member of the younger branch of the Yorkshire family.

¹¹ Washington's half-brother and guardian, Lawrence Washington, married Anne Fairfax, whose cousin, the sixth Lord Fairfax, owned enormous estates in Virginia and Pennsylvania. This Lord Fairfax was Washington's earliest patron, engaging the 16-year-old youth to survey some of the American holdings; the Fairfax-Washington connection was a strong one; see the first volume of D. S. Freeman's *George Washington* (New York, Scribner's, 1948) for a detailed account of the Fairfaxes and Washingtons in Virginia. Mrs. Somerville erroneously claims that Washington's mother was a Fairfax (*op. cit.* (9), 227).

¹² The house in which the family lived, given to Adm. Fairfax by his father-in-law in 1789, still stands. In 1957 two early seventeenth-century painted ceilings of great interest were accidentally discovered in it. See "Painted Ceilings from Mary Somerville House", by M. R. Apter, *Proceedings of the Society of Antiquaries of Scotland*, xci (1957-1958), 144-176.

Conversations when binding the book and from it had his first instruction in chemistry and electro-chemistry; he always expressed "deep veneration" for Mrs. Marcet as his earliest teacher in the science (see L. P. Williams, *Michael Faraday* (New York, Basic Books, 1965), 19-20, and E. F. Smith, "Jane Marcet", *Old Chemistries* (New York, McGraw-Hill, 1927), 64-71).

⁶ Caroline Herschel (1750-1848), sister of Sir William Herschel and aunt of Sir John, assisted her brother in his astronomical work, discovered eight comets, several nebulae and star clusters herself, and in 1798 prepared a star catalogue. In her note of thanks to Augustus De Morgan, Secretary of the Royal Astronomical Society, for his letter notifying her of her election to an honorary membership in the body, Miss Herschel expresses "... regret that at the feeble age of 85 I have no hope of making myself deserving of the great honour of seeing my name joined with that of the much distinguished Mrs. Somerville" (see Mrs. John Herschel, *Memoir and Correspondence of Caroline Herschel* (New York, 1876), 271). Mrs. Somerville regarded all the Herschels with deep admiration and affection.

⁷ Maria Mitchell (1818-1889), astronomer, discoverer of a comet, first women professor of astronomy and director of the observatory at Vassar College, first woman member of the American Academy of Arts and Science, and early Fellow of the American Association for the Advancement of Science. Her journal contains a long account of her meeting with Mrs. Somerville in Florence in 1858, ending with the statement, "Mrs. Somerville at the age of 77 was interested in every new improvement, hopeful, cheery and happy. Her society was sought by the most cultivated people in the world." See Maria Mitchell, *Life, Letters and Journals*, compiled by P. M. Kendall (Boston, Mass., 1896), 159-163. Miss Mitchell kept a plaster bust of Mrs. Somerville in her parlour at the Vassar Observatory (*ibid.*, 217).

animals, but with so little formal education that her father, returning home from sea when she was almost nine, "... was shocked to find ... such a savage".¹³ She could read "... very badly and with a strong Scotch accent".¹⁴ but did not learn to write or do accounts until, at ten, she was sent for a term to Miss Primrose's boarding school at Musselburgh in Midlothian. These twelve months were the only formal schooling of her life, although as a young lady in Edinburgh she had lessons in dancing, music, painting and cookery.

Miss Primrose's was expensive, and when Mary failed to do creditably even the little which her lenient mother desired, "... to write well and keep accounts, which was all a woman was expected to know",¹⁵ she was brought back home. Her life until 1804, when she married a distant cousin, Samuel Greig, was that of a well-connected young lady of no fortune: winters spent in Edinburgh, the rest of the year at Burntisland and visiting family and friends in Scotland. She is described as "extremely pretty",¹⁶ a petite figure with light brown hair, grey eyes and a lovely pink complexion, whose pleasing shyness of manner did not prevent her entering with zest into the life of balls, theatres and parties that gave Edinburgh a special sparkle during the second half of the eighteenth century. She read poetry, she played the pianoforte (but not cards!), she painted, she taught herself a bit of Greek and Latin and studied French, excelled at needlework and fine cookery and enjoyed her life as an Edinburgh belle. At Burntisland she spent hours in careful observation of the wild life, the birds and flora of the Scottish coast, indulging a passion for natural history that never left her.

Her flair for mathematics was revealed almost accidentally: shown a ladies' fashion magazine¹⁷ at a tea-party, she was mystified by a puzzle whose answer was given in strange symbols. These were said to be connected with "algebra", a word whose meaning was known neither to her nor to the owner of the magazine. She attempted, in vain, to decipher the symbols, using a book on navigation that she found at Burntisland. Not until the fifteen-year-old girl overheard her painting teacher in Edinburgh recommend Euclid's *Elements of Geometry* to help with pers-

¹³ Somerville, *op. cit.* (9), 20.

¹⁴ *Ibid.*

¹⁵ *Ibid.*

¹⁶ *Ibid.* Mrs. Somerville's beauty is also mentioned in published and unpublished letters of several early nineteenth-century notables, among them Maria Edgeworth, Harriet Martineau and Charles Greville; they also praise her manner, intelligence, character and learning.

¹⁷ The magazine is not yet identified with certainty. It may have been an issue of *The Ladies' Diary*, about which the mathematician John Playfair remarked in 1808, "... It has now been continued for more than a century; the poetry, enigmas &c. which it contains are in the worst taste possible; ... the scraps of literature and philosophy ... childish or ... old-fashioned ... but the geometrical part ... has always been conducted in a superior style; the problems proposed have tended to awaken curiosity, and the solutions to convey instruction in a much better manner than is always to be found in more splendid publications." See John Playfair, "Art. I. La Place, *Traité de Mécanique céleste*", *Edinburgh Review*, ii (January 1808), 282.

pective¹⁸ did she have a clue as to where to turn. With some difficulty¹⁹ she obtained a copy of Euclid and also of Bonnycastle's *Algebra* and quietly began to teach herself these subjects. When her parents discovered that she was reading geometry, algebra and classics in her bedroom late at night, the practice was immediately forbidden, her father exclaiming in horror, "Peg, we must put a stop to this, or we shall have Mary in a strait jacket one of these days. There is X., who went raving mad about the longitude."²⁰ The stubborn girl took to rising at daybreak and, wrapped in a blanket against the cold, studying till breakfast time. Her indolent and indulgent mother permitted her on occasion a few hours study with the village schoolmaster, who taught her to use the terrestrial and celestial globes and encouraged observations of the visible heavens and an interest in geography.

Her first husband Samuel Grieg, a captain in the Russian Navy, ". . . had a low opinion of the capacity of . . . [the female] sex, and had neither knowledge of nor interest in science of any kind".²¹ He was the son of one admiral in the Russian navy, Sir Samuel Greig (1735-1788), and the brother of another, Alexander Samuel Greig (1775-1845). His father had been one of five young British officers dispatched to Russia in 1763 at the request of the Empress Catharine to reorganize her navy and had stayed on to make his career and rear his family there. Young Samuel, who met Mary Fairfax when he was sent to Britain on a naval training mission, obtained, on his marriage, a commissionership in the Russian navy and appointment as officiating Russian consul in London. There the young couple lived until his death three years later, 1807. He left two small sons: Woronzow,²² named after the Russian ambassador to Britain, whose daughter, later Countess of Pembroke and mother of Sidney Herbert, stood godmother to the child, and David, who died in late infancy. Mary Greig returned with her young children to her parents' home in Scotland and, with the freedom and independence conferred by widowhood and the management of a comfortable inheritance, was able to turn openly to mathematical studies. Advised by John Wallace, later professor of mathematics in Edinburgh, she began to read through a small collection, mostly in French, of mathematics books which he recom-

¹⁸ Mary Somerville quotes her teacher, the landscape artist Alexander Nasmyth, as saying to the Ladies Douglas, "You should study Euclid's Elements of Geometry; the foundation not only of perspective, but of astronomy and all mechanical science." She instantly realized on hearing these words that geometry would help her to understand the books on navigation in the Fairfax household. Somerville, *op. cit.* (9), 49.

¹⁹ ". . . as to going to a bookseller and asking for Euclid the thing was impossible. Besides I did not yet know anything definite about algebra, so no more could be done at that time; but I never lost sight of an object which had interested me from the first." *Ibid.* Mary Fairfax persuaded her younger brother's new tutor, Peter Craw, to buy the books for her in Edinburgh. Craw was a classical scholar and knew little mathematics.

²⁰ *Ibid.*, 20.

²¹ *Ibid.*, 75.

²² Woronzow Greig (1805-1865), educated at Charterhouse and Trinity College, Cambridge, was a widely-respected barrister-at-law and Clerk of the Peace for Surrey.

mended;²³ she had already studied “. . . plane and spherical trigonometry, conic sections, and Fergusson’s *Astronomy*” and had “. . . attempted to read Newton’s *Principia* . . .”,²⁴ which she found very difficult.

Mary Greig was twenty-eight when she began this serious self-education in mathematics. Still beautiful—even as an old woman she is said to have been lovely²⁵—still shy, yet gay and full of fun, devoted to music and the theatre, the young widow moved in the best circles of Edinburgh society at one of its most brilliant periods, on friendly terms with its leading intellectuals—Brougham, Jeffrey, Sydney Smith, Playfair, Leslie, Gregory, Lockhart and Sir Walter Scott. In 1812 she married again, this time her first cousin, William Somerville,²⁶ son of her aunt Martha Charters and Dr. Thomas Somerville, minister of the kirk at Jedburgh, a scholar and historian who had always encouraged her studious interests. William Somerville had been an Army doctor in South Africa and in Canada and had travelled on the Continent before his return to Scotland in 1811. He was handsome, educated—though not learned—and his opinions, like those of his wife, were much more liberal and advanced than was usual among their families or among Scotsmen of the time. He warmly approved the education of women and vigorously encouraged and assisted his wife in her mathematical and scientific work during the whole of their long life together. In 1816, when he was appointed to the Army Medical Board as one of its principal inspectors, the family moved from Edinburgh, where he had held a similar post, to London and Mrs. Somerville’s career as a scientific lady may be said to have begun.

They took a house in Hanover Square, within walking distance of the Royal Institution. Through their many Scottish friends they were introduced into the heart of London scientific and literary society. Somerville became a Fellow of the Royal Society;²⁷ he and his wife were familiar and popular figures among the London intelligentsia, on warm terms of friendship with the Herschels, the Katers, the Davys, the Thomas Youngs, the Murchisons, Babbage, Wollaston and many other literary and philosophical lions. Though Whig in sympathy, both managed throughout long lifetimes to steer clear of disruptive political or religious controversy and to find a congenial place in all circles of the intellectual world. Invitations to Mrs. Somerville’s breakfasts and to her small

²³ Wallace in a letter dated 12 July 1811 (Somerville Collection) reports to Mrs. Grieg [*sic*] that he was in Edinburgh for delivery to her a silver medal, her prize as winner, for her solution of the Prize Question for the Mathematical Repository. Such a medal is now in the possession of Sir Brian Fairfax-Lucy, bearing the legend, “*Mariae Greig, L.M.D. Palmam qui meruit Ferat*”. The mathematics books are listed on pages 79 and 80 of her *Personal Recollections*; all except Biot’s *Analytical Geometry and Astronomy* are now at Girton College.

²⁴ Somerville, *op. cit.* (9), 61.

²⁵ *Ibid.* See also F. P. Cobbe’s “People One Meets in Italy” in *Italics* (London, 1864), 437–445 for a description of Mrs. Somerville in her 84th year.

²⁶ William Somerville (1771–1860) was a graduate in medicine of the University of Aberdeen.

²⁷ On 11 December 1817.

evening parties were prized.²⁸ She and her husband were frequently included in gatherings to meet such distinguished foreign visitors as Arago and Biot and many long friendships began in these early London years.

When in 1817 the Somervilles made a Continental tour, they were entertained in Paris by the French savants—among the Somerville papers there is a charming diary kept by Mary Somerville during two weeks of her visit to France, in which she describes her hospitable reception by Arago, Biot, Bouvard, Cuvier, Gay-Lussac, Haüy, Laplace, Lucas, Poisson and others. In Switzerland De Candolle, De la Rive, the Marcets, Prevost and Sismondi welcomed the travellers. During that winter in Italy, the Somervilles were associated with a large and distinguished band of English visitors, as well as with Italians celebrated in the scientific, artistic and public life of the country. On their return to London, intimacy with the same sort of company grew. Dinner parties, often with the brilliant Whig literary circle that included the Macaulays and the poets Rogers, Campbell, William Spencer and Thomas Moore, house parties at Beechwood, the home of Sir John Sebright, with fellow-guests of renown, country excursions outside London, lectures at the Royal Institution, and attendance at various public Court functions were part of their everyday life.

Wollaston became a close friend; to Mrs. Somerville he presented the prism²⁹ with which he had discerned the seven dark lines crossing the solar spectrum and to her he bequeathed his fine cabinet of minerals.³⁰ Thomas Young, whom she greatly admired, announced to her within hours of its discovery his method of dating Egyptian papyri by relating their astronomical signs to the configuration of the heavens obtaining at the time they were inscribed. Babbage was a valued companion and the Somervilles were invited frequently to his parties and to inspect his calculating engines. They were often at Slough visiting the Herschels and viewing the heavens through the large telescope there. Mary Somerville heard all kinds of scientific subjects discussed, watched innumerable astronomical observations made, and witnessed countless experiments. Her informed interest, her eagerness to learn, and the high regard in which

²⁸ Maria Edgeworth wrote Mrs. Edgeworth from Beechwood Park on 16 January 1822 of the Somerville establishment in Hanover Square, "... Dr. Wollaston & Dr. Holland—and Mr. Warburton and Kater & all the scientific and literary society in London drop ... in ... daily to call ...' (Edgeworth Letters, Bodleian Library).

²⁹ The prism is now at Greenwich, deposited there by Mrs. Somerville's present heir, Sir Brian Fairfax-Lucy. Mrs Somerville in speaking of her life in London between 1816 and 1830 says (*op. cit.* (9), 133-134) that she was "... among the first, if not the very first, to whom he [Dr. Wollaston] showed these lines ...", a puzzling statement since Wollaston reported his discovery in 1802 (see *Phil. Trans.*, 1802, 385-386).

³⁰ Among the Somerville papers is a note from Wollaston written from Dorset Street on 7 December 1828 desiring Mrs. Somerville to retain the cabinet "... as a token of friendship". No trace of the Wollaston scientific papers, said to have been bequeathed to Mrs. Somerville through Henry Warburton (see *DNB*), has been uncovered in the Somerville Collection to date.

she held the experimenter, the natural historian, the scientific traveller and the natural philosopher—joined to her innate modesty and charm of manner—won the attentive notice of the leading scientific men of the day. They were pleased to answer her questions, to send her books and pamphlets, to invite her to meetings and lectures on their specialities. No tone of condescension is discernible in their letters to, or their remarks about, her;³¹ they took Mrs. Somerville seriously and admitted her as a colleague. She was as warmly received by their wives and by a host of women friends—Jane Marcet, the Misses Berry, Maria Edgeworth, Harriet Martineau, Joanna Baillie, Elizabeth Fry, Mrs. Opie, Lady Byron and her daughter (later Lady Lovelace)—to name only a few who were her frequent companions and loving admirers.

When Dr. Somerville was appointed Physician to Chelsea Hospital in 1824, they went to live in a government house in Chelsea College on the outskirts of London. Much saddened at the time by the death of their eldest daughter, one of several young children whom they lost, Mrs. Somerville never wholly welcomed this move from the West End, although financially it was helpful to the family. Prompted no doubt by the attention so many of their scientific friends were giving to the question of light, electricity and magnetism, she began a series of simple experiments typical of her approach to investigative science, designed to see whether light rays possessed magnetizing powers. Covering half a long non-magnetic steel sewing needle with paper, she exposed the uncovered half for some hours to selected solar rays obtained with a prism. She concluded from her trials that magnetism was induced by the rays of the blue-green-violet end of the spectrum and that “the least refrangible” of these rays were the most powerful. Her findings were communicated to the Royal Society by her husband and appear in the *Philosophical Transactions*.³² This “delicate and difficult . . . inquiry . . . [conducted in a] simple and rational manner—the absence of needless complications and refinements in . . . [its] plan, and of unnecessary or costly apparatus in . . . [its] execution—and the perfect freedom from all pretension or affected embarrassment in . . . [its] statement” were cited with respect by Sir John Herschel³³ in introducing Mrs. Somerville seven years later to his readers in an essay appearing in the *Quarterly Review*. Her experimental results and conclusions,

³¹ A short note in the Somerville Collection, from Charles Babbage to Mrs. Somerville, is exemplary on this point: “My dear Mrs. Somerville/Prof. Powell’s paper on Dispersion was read ‘popularly at the British Assn. at Dublin and has I believe been printed fully either in the last Vol. of the Phil. Trans. or in that which is about to appear. It is the following of Cauchy’s Analysis and comparing it with (I think) Frauenhofers experiments/I am sincerely yours/C Babbage/Dorset St./8 Oct 1835.”

³² “On the Magnetizing Power of the more Refrangible Solar Rays”, by Mrs. M. Somerville. Communicated by William Somerville, M.D., F.R.S., Feb. 2, 1826. *Phil. Trans.*, cxvi (1826), 132.

³³ Sir John Herschel, “Mechanism of the Heavens”, *Quarterly Review*, xlvii (July 1832), 547–548.

widely accepted at first,³⁴ were later disputed and, after some years, the manifest effect which she had obtained was shown by other investigators³⁵ not to be due to the violet rays.

A second piece of original scientific work was undertaken by Mrs. Somerville ten years after the first: an investigation of the permeability of various bodies to the chemical rays of the sun. Arago, on receiving her account of this study,³⁶ presented it to the *Académie des Sciences* with lavish praise for the investigator. The third—and apparently last—of her original investigations was reported in 1845 in the *Philosophical Transactions* when Sir John Herschel sent to the Royal Society “an extract of a letter”³⁷ which he had received from her and which told of her experiments on the effect of the solar spectrum on plants and other substances. Despite this recognition and commendation of sound experimental work, her own appraisal of her researches is a poignant one; a paragraph in one of the manuscript drafts of her autobiography reads

“In the climax of my great success the approbation of some of the first scientific men of the age and of the public in general I was highly gratified, but much less elated than might have been expected, for although I had recorded in a clear point of view some of the most refined and difficult analytical processes and astronomical discoveries, I was conscious that I had never made a discovery myself, that I had no originality. I have perseverance and intelligence but no genius, that spark from heaven is not granted to the sex, we are of the earth, earthy, whether higher powers may be allotted to us in another existence God knows, original genius in science at least is hopeless in this.”³⁸

Life in Chelsea went on for the Somervilles much as it had in London. Dr. Somerville's duties left him leisure for convivial evenings with his friends in the Royal Society,³⁹ for aiding his wife in her studious pursuits,⁴⁰ and for the usual London activities. Mrs. Somerville, busy with her growing young family, still had ample time for her friends, for the theatre

³⁴ The Viennese professor, A. Baumgartner, for example, suggested some modifications in the procedure used by Mrs. Somerville (and earlier by M. Morichini) but supported her results and conclusions in a repetition of the study. See Baumgartner, “Sur l'Aimantation de l'acier par la lumière blanche directe du soleil”, *Ann. chim. phys.*, xxxiii (1826), 333-335.

³⁵ Peter Riess and Ludwig Moser, “Ueber die magnetisirende Eigenschaft des Sonnenlichts”, *Annalen der Physik und Chemie*, xcii (1829), 563-592.

³⁶ *Comptes rendus*, iii (1836), 473-476. Arago, in presenting the extract of a letter from Mrs. Somerville as a paper entitled, “Experiments on the Transmission of Chemical Rays of the Solar Spectrum across Different Media”, states that he offers “. . . aux intéressantes expériences d'une personne si éminemment distinguée, toute la publicité des séances de l'Académie et du *Compte rendu*”.

³⁷ “On the action of the Rays of the Spectrum on Vegetable Juices”, being an extract from a letter by Mrs. M. Somerville to Sir John Herschel, Bart., dated Rome, 20 September, 1845. Communicated by Sir John F. W. Herschel, Bart., *F.R.S. Abstr. Phil. Trans.*, v (1843-1850), 569.

³⁸ Hand numbered, “34”. Manuscript is in the Somerville Collection.

³⁹ Geikie in his *Annals of the Royal Society Club* (London, 1917) lists Dr. Somerville as being twice a guest, once in 1821 (p. 274) and again in 1824 (p. 284). The dining club bills among the Somerville papers indicate a high degree of sociability.

⁴⁰ Much of Mrs. Somerville's scientific correspondence, especially in the period 1817-1840, was carried on through Dr. Somerville. Typical of such letters is one from Francis Baily, dated 3 February 1833, beginning, “My dear Sir/I should be most happy to answer Mrs. Somerville's enquiries, relative to the compression of the earth, as deduced from geodesical measurements, & from experiments on the pendulum . . .” (Somerville Collection). Dr. Somerville also made use of the library of the Royal Society for his wife, as well as arranging her introduction to members and visitors. He was, in short, from the very first an admirable aide.

and opera, and for her studies in mathematics, science and mineralogy, to the last of which she and Somerville has been attracted while still in Edinburgh. The superior domestic management, the warm-hearted sociability and the thoughtful, loving care of children displayed by Mrs. Somerville were to return unexpected dividends in the next decades: the "womanliness" which she exhibited in these ways made her more acceptable as a "scientific lady" to both the public at large⁴¹ and her scientific peers.⁴² Her demonstrations that a female could combine learning, especially mathematical and scientific learning, with all the attributes of a good wife and mother and a gracious companion became a powerful argument for the education of women in every field.⁴³

The character and course of Mary Somerville's future life were altered from domesticity to professionalism by a letter dated 27 March 1827. Addressed to Dr. Somerville and written by Henry, Lord Brougham and Vaux, it asked him to be the latter's advocate in persuading Mrs. Somerville to write an account of Laplace's *Mécanique céleste* for Brougham's "Society for Diffusing [*sic*] Useful Knowledge". "In England", he continued, "there are not now twenty people who know this great work, except by name; and not a hundred who know it even by name. My firm belief is that Mrs. Somerville could add two cyphers to each of these figures."⁴⁴ ⁴⁵ After some initial hesitancy on her part, she was induced to undertake the task, setting the conditions that the work would be kept secret and the manuscript, if found unsatisfactory, would be burnt. She had met Laplace in Paris in 1817 and had been invited to spend a day at his country home at Arcueil;⁴⁶ they kept up a scientific correspondence until his death in February 1827. For the next four years she worked at the book,

⁴¹ Maria Edgeworth (unpublished letter dated 11 March 1822, Bodleian Library): "My dear Sneyd . . . She [Mrs. Somerville] has a combination of talent . . . science and good household qualities which make her adored of her husband at home and all the world abroad . . ."

⁴² J. G. Children, officially informing Mrs. Somerville of a decision concerning her made by the Royal Society, wrote in a letter dated 19 February 1832 that the members of the Society would " . . . honour Science, their country and themselves, in paying this proud tribute to the powers of the female mind—and at the same time establish an imperishable record of the perfect compatibility of the most exemplary discharge of the softer duties of domestic life, with the deepest researches in Mathematical Philosophy . . ." (Somerville Collection).

⁴³ Preserved among the Somerville papers is a clipping from an English newspaper, dated in Mary Somerville's hand "May 1869" but not otherwise identified, which contains the sentence, "The assertion that if women are educated scientifically they will cease to be 'domestic and feminine' in their tastes has never met a more thorough contradiction than in the instance of the most scientifically educated and competent woman of her age [Mrs. Somerville]". *Nature* (2 April 1872, 417) says of Mrs. Somerville, "No one . . . could possibly have afforded a stronger refutation of the axiom, almost universally upheld a century ago, that scientific acquirements of a high order are wholly incompatible with the proper exercise of the natural and ascribed functions of a woman's destiny . . ."

⁴⁴ Somerville, *op. cit.* (9), 161-162. The original of this letter is in the Somerville Collection.

⁴⁵ Earlier Playfair, in his 1808 review of Laplace's *Mécanique céleste* (*op. cit.* (17), 281) had made a comparison of mathematics in France and England, to the discredit of the latter. "If we come to works of still greater difficulty [than those of Euler and D'Alembert], such as the *Mécanique céleste*, we will venture to say, that the number of those in this island who can read the work with any tolerable facility, is small indeed . . . we shall not hardly exceed a dozen . . ."

⁴⁶ Somerville, *op. cit.* (9), 109-111. A brief account of Mrs. Somerville's visit to Arcueil is reproduced in: M. P. Crosland, *The Society of Arcueil* (London, Heinemann, 1967), p. 411.

at the same time continuing her busy domestic and social life, as well as over-seeing the education of her two young daughters, determined that they should not lack as she had for opportunities for systematic learning.

*The Mechanism of the Heavens*⁴⁷ was published in 1831, dedicated to Lord Brougham, though plans to make it part of his Library of Useful Knowledge had been abandoned as impracticable. In no sense was it a mere translation of Laplace's work. Instead it endeavoured to explain his method ". . . by which these results were deduced from one general equation of the motion of matter"⁴⁸ and to bring the reader's mathematical skill to the point where the exposition of Laplace's mathematics and ideas would be meaningful—then to give a digest in English of his great work. Diagrams were added when necessary to the original text and proofs of various problems in physical mechanics and astronomy included.

The book was an instant success; its first edition of 750 copies was sold out almost at once. Reviews⁴⁹ were laudatory and letters of praise from scientific men⁵⁰ poured in on its author. The Royal Society voted unanimously to place her bust⁵¹ in their Great Hall. Chantrey, a personal friend, was commissioned to do this work and his fee quickly subscribed by a long list of her admirers among the membership.⁵² Biot⁵³ reviewed the work in glowing terms for the *Académie des Sciences*. Its preface, which she had written to provide the necessary background for the reader, was reprinted and sold as a separate volume,⁵⁴ winning wide acceptance among general readers and, like the complete work, being pirated by American publishers.⁵⁵ Whewell⁵⁶ and Peacock⁵⁷ at Cambridge used Mrs. Somerville's *Mechanism of the Heavens* in their advanced mathematics

⁴⁷ Mary Somerville, *The Mechanism of the Heavens* (London, John Murray, 1831).

⁴⁸ "Mary Somerville" in *The Leisure Hour* (London, October 1871), 634.

⁴⁹ Herschel reviewed the book for the *Quarterly Review* (*op. cit.* (33), 537-559). Thomas Galloway, a respected mathematician and son-in-law and former pupil of Mrs. Somerville's teacher, John Wallace, wrote the piece for the *Edinburgh Review* (see *Edinburgh Review*, lv (August 1832), 1-25). Both these lengthy reviews are admiring, while a shorter one in *The Athenaeum* (No. 221, 21 January 1832, 43-44) divides itself between a derisory attack on Brougham's idea of putting Laplace in "the hands of the unwashed" and condemnation of Mrs. Somerville for attempting "to bottle up the spirit of Laplace in an octavo". Almost 40 years later the same journal (No. 2154, 6 February 1869, 202) in a review of Mrs. Somerville's last book refers to *The Mechanism* as "her admirable summary of the *Mécanique céleste* of Laplace".

⁵⁰ Somerville, *op. cit.* (9), 170-175. The originals of these letters are in the Somerville Collection, which contains many other congratulatory messages on the work.

⁵¹ The bust is still in possession of the Royal Society. Part of the official letter of the Secretary, J. G. Children, to Mrs. Somerville on this action has been quoted in (42).

⁵² The list is preserved among the Somerville papers. Sixty-four subscribers, headed by the Duke of Sussex, are shown as contributing a total of 144 guineas.

⁵³ *Procès-verbaux*, x, 23 (13 February 1832).

⁵⁴ Mary Somerville, *A Preliminary Dissertation on the Mechanism of the Heavens* (London, John Murray, 1832).

⁵⁵ Carey and Lea published an edition in Philadelphia in 1832.

⁵⁶ Somerville, *op. cit.* (9), 170-172. The original letter and poem are in the Somerville Collection. Whewell wrote his sister on 13 March 1832 that he wanted to make the mathematics book he was then preparing for ". . . the Cambridge folks . . . correspond with [Mrs. Somerville's], so that they may each help to make the other intelligible and useful". See *Life of Dr. Whewell* by Mrs. Stair Douglas (London, 1881), 143.

⁵⁷ Somerville, *op. cit.* (9), 172. Peacock's letter is among the Somerville papers.

classes; indeed, for almost a hundred years after its appearance the book continued to serve as a textbook for higher mathematics and astronomy in English schools.

Mary Somerville and her readers had discovered that she had a knack of clear and lucid exposition of scientific and mathematical material. She had discovered, at the age of fifty-one, that she enjoyed writing. In preparing the long preface to *The Mechanism of the Heavens* she had been struck by the "... mutual dependence and connection in many branches of science",⁵⁸ and she set about developing this as the theme for a second book. Early in 1834 her *On the Connexion of the Physical Sciences*⁵⁹ appeared and again her efforts met with great approval.⁶⁰ The Royal Astronomical Society,⁶¹ hailing the "astronomical merit" of both, named her, along with the aged Caroline Herschel, as their first female honorary members. The Royal Academy of Dublin, led by William Rowan Hamilton,⁶² the Bristol Philosophical Institution, under W. D. Coneybeare,⁶³ and the *Société de Physique et d'Histoire Naturelle* of Geneva, under Prevost,⁶⁴ all conferred honorary memberships upon her.

This book, like her first, was published by John Murray. When Brougham decided in 1830 that *The Mechanism of the Heavens* was too voluminous for his Library of Useful Knowledge, Dr. Somerville sent the manuscript to Murray, along with Sir John Herschel's favourable assessment of the work.⁶⁵ The publisher had little hope at the time that a purely scientific and mathematical book by an unknown author would succeed but agreed to print 1,500 copies (later reduced to 750) at his "... own cost and risque, and in case of their selling ... to give the author two-thirds of the profits and ... the copyright ...".⁶⁶ Murray's services

⁵⁸ *Ibid.*, 178.

⁵⁹ Mary Somerville, *On the Connexion of the Physical Sciences* (London, John Murray, 1834).

⁶⁰ The article for the *Edinburgh Review* (lix, (April 1834), 154-171) was written by Sir David Brewster, the one for the *Quarterly Review* (li (March 1834), 54-68) by William Whewell. It is in the latter article that Whewell suggest the name "scientist" to "... designate the students of the knowledge of the material world ..."; he concludes his review with his verses to Mrs. Somerville (see (56)). *The Athenaeum* (No. 33, 15 March 1834, 202-203) calls the volume "delightful" and "... with the exception of Sir John Herschel's treatises, the most valuable and pleasing work of science that has been published within the century".

⁶¹ Augustus De Morgan, Secretary of the Royal Astronomical Society, to Mrs. Somerville, 13 February 1835, officially notifying her of her election (Somerville Collection). See also *Royal Astronomical Society Monthly Notices*, iii, 1835, 91.

⁶² W. R. Hamilton to Mrs. Somerville, 27 May 1834 (Somerville Collection); the diploma is also among these papers.

⁶³ W. D. Coneybeare to Mrs. Somerville, n.d. (Somerville Collection). Coneybeare and Prichard's *The West of England Journal* (Bristol, 1835-36) applauds *Physical Sciences* in a review (pp. 247-250) of the second edition that points to "connexion" as indicating "... the uniformity or identity of the laws to which ... sciences are subjected ..." and also the "... subserviency ..." of some sciences to others.

⁶⁴ Somerville, *op. cit.* (9) 209-210. The letter from Mrs. Marcet here quoted and a diploma dated 3 Avril 1834 are among the Somerville papers.

⁶⁵ Herschel "... pronounced it [*The Mechanism*] a book for posterity and above the class for whose instruction it had been intended by Mr. Brougham". See Samuel Smiles, *A Publisher and His Friends: Memoir and Correspondence of the Late John Murray* (London, John Murray, 1891), ii, 406-410.

⁶⁶ The letters from Murray are in the Somerville Collection.

to science in publishing a large number of important works of scientific interest and in establishing such a tradition for his house⁶⁷ are admirably illustrated by this association with Mrs. Somerville. When, to their surprise, *The Mechanism of the Heavens* sold well, he refused to take any profit for himself, saying that he was "... overpaid by the honour of being the publisher of the work of so extraordinary a person".⁶⁸ When her subsequent books appeared, the Murrays held to the same generous agreement first proposed for *The Mechanism*. The cordial friendship that existed between the Somerville and Murray families continued after the succession of "Young Jock" Murray, on the death of his father in 1843. Both Murrays supplied Mrs. Somerville with the latest books on science, furnished her yearly with detailed accounts of the sales of her works, on occasion tactfully and ungrudgingly advanced her funds, and after her death published, as an act of homage, her memoirs.⁶⁹ Between 1834 and 1877 Murray brought out ten editions⁷⁰ of *On the Connexion of the Physical Sciences*, each one—except for the last, which appeared five years after its author's death—revised and brought up to date by Mrs. Somerville and each applauded by expert and lay opinion alike. The total sales of the first nine editions were remarkable for a scientific book, over 15,000 copies in the English editions alone. Translations were made into German, French and Italian; from these and the pirated American editions—all of which were popular—Mrs. Somerville received very little money, in contrast with the steady income from Murray.

The impact of the book on the development of science poses some interesting questions for the historians of science. Clerk Maxwell⁷¹ classed it as one of those

"... suggestive books, which put into definite, intelligible, and communicable form, the guiding ideas that are already working in the minds of men of science, so as to lead them to discoveries, but which they cannot yet shape into a definite statement."

He argues eloquently that such books, as well as the making and reporting of discoveries, advance science, though "... it is for the historian of science

⁶⁷ Both Murray and his son had close connections with the scientific as well as the literary life of their times. Smiles (*op. cit.* (65), i, 264) describes Murray's drawing-room in Albemarle Street in the second decade of the nineteenth century as "... the centre of literary friendship and intercommunication at the West End ... for the association of gentlemen known for their literary, artistic or scientific attainments" until the establishment of the Athenaeum Club in 1823. Murray published the works of such scientists and scientific travellers as Lyell, Murchison, Sir John Franklin, Capt. Basil Hall, Capt. Sabine, Sir James Ross and Charles Darwin. Mrs. Somerville met and corresponded with all these gentlemen. Murray's *Quarterly Review* featured many articles of scientific interest.

⁶⁸ *Ibid.*, ii, 407. The letter is in the Somerville Collection.

⁶⁹ Accounts rendered and business correspondence between the Somervilles and the Murrays for the period 1831-1875 are part of the Somerville Collection and reflect each of these points.

⁷⁰ The successive editions appeared in 1834, 1835, 1836, 1837, 1840, 1842, 1846, 1848, 1858 and 1877, the last one having additional material by Arabella B. Buckley.

⁷¹ J. C. Maxwell, "Grove's *Correlation of Physical Forces*", *Scientific Papers* (Cambridge, 1890), ii, 401. Maxwell wrote the review of Grove's book for *Nature* in 1874.

to determine the magnitude and direction of the impulse communicated by either of these means to human thought". Maxwell, in his discussion, concerns himself with the shaping of the concept of the conservation of energy during the first half of the nineteenth century, citing the eight editions of *Physical Sciences* between 1834 and 1849 as evidence "... that there existed a widespread desire to be able to form some notion of physical science as a whole". In another instance, two sentences⁷² in the sixth edition of the work are alleged to have been a principal reason for John Couch Adams's calculation of the orbit of Neptune and subsequent discovery of that planet.⁷³

Throughout the successive editions of *On the Connexion of the Physical Sciences*, the basic character and pattern of the book remain the same; even its words, in many cases, are unaltered. Changes come about by the addition of new information, discoveries and interpretations and by dropping or modifying out-of-date material. The treatment is entirely descriptive; mathematics in the text are verbalized, demonstrations by formulae and diagrams being reserved for the appended notes, which also present a glossary. Firmly grounded on Newtonian ideas and on his mechanics as used by the French mechanicians, the work draws heavily upon Mrs. Somerville's knowledge of physical astronomy; well over a third of the text is assigned to this subject, which both begins and ends the volume. An initial consideration of Newton's laws and of celestial and terrestrial motion is followed by an examination of some other aspects of mechanics, especially hydrostatics and pneumatics, of meteorology, and of sound. Optical phenomena and optical laws are discussed in some detail, strong support for Young's undulatory theory being advanced in every edition.⁷⁴ The general topic of heat shows, through the decades, many changes in its treatment, as do the subjects of electricity and magnet-

⁷² "Those [the tables of motion] of Uranus, however, are already defective, probably because the discovery of that planet in 1781 is too recent to admit of much precision in the determination of its motion, or that possibly it may be subject to disturbance from some unseen planet revolving about the sun beyond the present boundaries of our system. If, after a lapse of years, the tables formed from a combination of numerous observations should still be inadequate to represent the motions of Uranus, the discrepancies may reveal the existence, nay even the mass and orbit of a body placed forever beyond the sphere of vision." The same words and pagination (page 60) are found in the 6th and 7th editions. In the 8th edition (again page 60) these sentences are followed by the words, "That prediction has been fulfilled since the seventh edition of this book was published . . ." and an account of the work of Adams and Leverrier follows.

⁷³ See *Personal Recollections* (*op. cit.* (9), 290). Also, among some rough autobiographical jottings in the Somerville Collection is Mrs. Somerville's note, "... spend time with Airy and Adam [*sic*] the latter tells Mr. S. that a remark of mine in *Phys Sci* put it into his head to compute the orbit of Neptune, if I had possessed originality or genius I might have done it (a proof that originality in discovery is not given to women???) . . .". Her strong support of Adams in the Adams-Leverrier controversy was the real reason, according to F. P. Cobbe (see *Life of Frances Power Cobbe by Herself* (Boston, 1894, ii, 350-351)) why Sir G. B. Airy refused, as Astronomer Royal, to make the necessary formal request for Mrs. Somerville's burial in Westminster Abbey after all other arrangements for this honour had been concluded. Further investigation of relations between the Somervilles and Airys is in hand.

⁷⁴ Somerville, *op. cit.* (9), 208-209. A letter from Brougham to Mrs. Somerville on the subject of Thomas Young is in the Somerville Collection.

ism. The latter two are consistently afforded an amount of space—about a quarter of the text—second only to astronomy. From the first the book carried an index, broadened in scope and improved in detail with successive editions; a full table of contents appeared in 1835 and thereafter. During the years 1834 to 1877 the quantity of text increased fourfold; the style, however, remained lucid and straightforward, the quality of the whole work extremely high.⁷⁵

Some months after the publication of the book, Sir Robert Peel awarded its author a civil pension of £200 annually, “. . . to encourage others to follow the bright example which you have set, and to prove that great scientific attainments are recognized among public claims”.⁷⁶ Civil pensions as rewards for scientific activities had been vigorously pushed for some years, especially by Babbage and Brougham. Even a cursory glance at their dispensation during the decade of the 1830's⁷⁷ casts an interesting light on the rising role of science in an era of political reform and upon the interactions of political astuteness and allegiances, regional pressures and personal friendships. Babbage's *Reflections on the Decline of Science in England* (1830) had been instrumental in gaining from Earl Grey's government in 1833 the award of an annual pension of £150 to John Dalton. Peel, coming to power in 1834, was determined not to let this practice, so vociferously championed by the opposing party, lapse.⁷⁸ To Mrs. Somerville, who could qualify both as a scientific and a literary personage, he awarded the same amount given earlier by him to Robert Brown the botanist. In that same year grants of £300 were made also to G. B. Airy and Michael Faraday,⁷⁹ while in 1836, under Melbourne's government, Dalton's pension was doubled and that of Sir David Brewster, an early recipient of such recognition, was raised from £100 to £300. In the following year Melbourne⁸⁰ increased Mrs. Somerville's

⁷⁵ Maxwell (*op. cit.* (71), 402) speaks of “. . . the universal facility and occasional felicity of expression that distinguish Mrs. Somerville's writing”.

⁷⁶ Somerville, *op. cit.* (9), 177. The original letter, dated simply March 1835, is in the Somerville Collection. J. W. Croker, in an undated letter to Peel, probably written on 18 January 1835 (see *The Croker Papers*, 2nd ed. revised, edited by L. J. Jennings (London, John Murray, 1885), ii, 257-259) strongly recommends a civil pension for Mrs. Somerville, whom he says he has never seen. He tells Peel that he has heard “. . . a whisper that Brougham had promised to do something for them [the Somervilles], and that they think he played false with them . . .”.

⁷⁷ Reingold touches on this matter in his “Babbage and Moll on the State of Science in Great Britain”, *Brit. J. for the Hist. of Sci.*, iv (1968-9), 59.

⁷⁸ Croker, *op. cit.* (76). Peel, in a letter from Whitehall dated 29 January 1835, tells Croker, “I must be very cautious not to *confine* pensions to Whigs or Liberal professors of literature”.

⁷⁹ Peel initiated the pension for Faraday but, upon his leaving office in mid-April 1835, it fell to Melbourne to bestow it. The famed interview between Faraday and Melbourne has often been recounted; its outcome was that Faraday accepted both Melbourne's apology and a pension (equal to that previously given Mrs. Airy at Airy's request). See H. Bence Jones, *Life and Letters of Faraday* (London, 1870), ii, 57.

⁸⁰ Mrs. Somerville states (*op. cit.* (9), 178) that the increase came about through “. . . the kindness of Lord John Russell, who was then the Prime Minister . . .”, but the official correspondence in the Somerville papers shows that Lord Melbourne made the recommendation. Russell was at that time Home Secretary in Melbourne's cabinet and leader of the House of Commons. William IV signed the King's Warrant for both grants, one on 6 May 1835 and the other on 10 August 1837. Mrs. Somerville lists Lord Melbourne as a guest at dinner parties which they attended in early London years.

grant to £300 annually,⁸¹ this sum becoming an important source of income to her family when the Somervilles suffered financial reverses after 1835.⁸²

In December of that year a long article on comets⁸³ written by Mrs. Somerville was published in the *Quarterly Review*. Halley's comet reappeared in early August 1835 and interest in the topic was high. This timely piece was ostensibly a review of two new works⁸⁴ on that comet, but in actuality it is a comprehensive and interesting account of the then-current views on the whole subject of comets. Not unsurprisingly the essay made use of some of the material in her *On the Connexion of the Physical Sciences*—often in its very words—and, equally to be expected, some of the essay in turn appeared in subsequent editions of that book. Seemingly Mrs. Somerville chose to write nothing else for the *Quarterly* and nothing at all for the *Edinburgh Review*,⁸⁵ despite her close connections with editors and contributors to both journals.

In 1848, when she was sixty-eight years old, Mary Somerville published her third and most successful book, *Physical Geography*.⁸⁶ Its seven editions^{87, 88} brought its author numerous honours: the Victoria Gold (Patron's) Medal of the Royal Geographical Society,⁸⁹ election to the Italian Academy of Science,⁹⁰ to the Italian Geographical Society,⁹¹ and to various provincial Italian scientific and literary societies,⁹² to the American Geographical and Statistical Society,⁹³ and to the American Philosophical Society,⁹⁴ as well as several medals.⁹⁵ The opening sentence

⁸¹ Some sense of the regard in which Mrs. Somerville was held by her contemporaries is reflected in the comment made by Mary Russell Mitford, who also received a civil pension of £100 from Melbourne in 1837. Miss Mitford, writing to a friend on 31 May 1837 to tell her of the grant, says, "The sum is small but that cannot be considered as derogatory . . . it being . . . the amount given . . . to Mrs. Hemans and Mrs. Somerville". See V. Watson, *Mary Russell Mitford* (London, Evans Bros., n.d.), 229.

⁸² Somerville, *op. cit.* (g), 178.

⁸³ Mary Somerville, "Astronomy—The Comet", *Quarterly Review*, cv (December 1835), 195-233.

⁸⁴ Von Littrow's *Ueber den Halleyschen Cometen* (Wein, 1835) and von Encke's *Ueber den Halleyschen Cometen* (Berliner Jahrbuch, 1835).

⁸⁵ Woronzow Greig, in a letter to his mother and Dr. Somerville dated 10 November 1847 concerning their financial plight, points out that by proper management and economy their debts could be reduced to £53 16s. 5½d., "which my mother could easily pay off by writing a paper or two for a Review" (Somerville Collection).

⁸⁶ Mary Somerville, *Physical Geography* (London, John Murray, 1848).

⁸⁷ The successive editions are dated 1848, 1849, 1851, 1858, 1862, 1870 and 1877. The last two editions were revised by H. W. Bates.

⁸⁸ The geographer Keith Johnston published a small *School Atlas of Ancient, Modern and Physical Geography* intended to be used with Mrs. Somerville's *Physical Geography*.

⁸⁹ The full account of the anniversary meeting of the Society at which the presentation was made, reported in *The Times* of Tuesday, 25 May 1869, is one of the few newspaper clippings among the Somerville papers.

⁹⁰ The diploma is dated 27 August 1856 (Somerville Collection).

⁹¹ The diploma is dated 15 May 1870 (Somerville Collection).

⁹² To judge from the diplomas in the Somerville Collection, Mrs. Somerville was made a member of at least eighteen different scientific societies, ten of them in Italy, from 1835 onwards.

⁹³ The diploma is dated 18 May 1857 (Somerville Collection).

⁹⁴ The diploma is dated 15 October 1869 (Somerville Collection).

⁹⁵ Including the Victor Emmanuel Gold Medal, 30 June 1869 (Somerville Collection).

of the book outlines its general contents precisely: "Physical Geography is a description of the earth, the sea and the air, with their inhabitants animal and vegetable, of the distribution of these organized beings, and the causes of that distribution." Not only does she describe the present state of the globe and its organized beings in systematic detail, but she treats also of the "... successive convulsions which have ultimately led to its present geographical arrangement, and to the actual distribution of land and water . . .",⁹⁶ relying upon the geological work then being done, especially that of Murchison and Lyell. Copy for the book was almost ready to go to press when Humboldt's *Kosmos*⁹⁷ appeared, a coincidence so distressing to Mrs. Somerville that she decided to burn her manuscript. Her husband and Sir John Herschel persuaded her to go ahead with publication; the book is dedicated to Sir John. Humboldt, whom she had met in England⁹⁸ and abroad,⁹⁹ praised the work in a letter to Mrs. Somerville¹⁰⁰ and remarked to Maria Mitchell in 1858 that it was "excellent because so concise. 'A German woman would have used more words.'"¹⁰¹

Eleven years later, at seventy-nine, Mrs. Somerville published her fourth book, *On Molecular and Microscopic Science*,¹⁰² two volumes dealing with the constitution of matter and the structure of microscopic plants and organisms. In terms of the large sales of the two previous books, this one was not a success.¹⁰³ Young John Murray, who had succeeded his father more than twenty years earlier, feared that its science was old-fashioned¹⁰⁴ and hoped to persuade her to abandon the work but went ahead with the publication from a sense of personal loyalty and again on the recommenda-

⁹⁶ Somerville, *op. cit.* (86), 2.

⁹⁷ The first volume of *Kosmos* appeared in 1848, the last posthumously in 1862.

⁹⁸ See J. Théodoridès, "Humboldt and England", *Brit. J. for the Hist. of Sci.*, iii (1966-7), 46.

⁹⁹ Somerville, *op. cit.* (9), 159.

¹⁰⁰ *Ibid.*, 287-289. A letter from Humboldt with a sketch of Halley's comet is among the Somerville papers.

¹⁰¹ Mitchell, *op. cit.* (7), 166.

¹⁰² Mary Somerville, *On Molecular and Microscopic Science* (London, John Murray, 1869).

¹⁰³ The 1873 business statement from Murray carries the note, "The molecular science has never yet repaid the cost of production. There is to date a deficiency of £89-2-8d. J. M." (Somerville Collection).

¹⁰⁴ Correspondence about the fate of this book went on among Mrs. Somerville, John Murray, Mrs. Woronzow Greig, Martha Somerville, and Sir John Herschel from 1866 until its appearance in 1869 (Somerville Collection). In 1868, in a letter dated 10 January, Murray urged Mrs. Somerville to withdraw the manuscript after he had received an unfavourable report from his reader, "... a competent man of science [not otherwise identified] in whose opinion no partial revision or correction of the sheets would suffice" and who "... declined to undertake the task". Murray concludes the letter with the statement, "It would require to be re-written in great part. Such are the extent and nature of the changes in science as seen in the nomenclature of terms which have taken place since you began writing it." His principal criticisms of the work were, in addition to the old-fashioned terminology used, "... the discovery of numerous serious errors in the sheets", the vast amount of material included (so much that he feared it would deter most readers), and the absence of chapter divisions and indices. He was concerned also with the steadily mounting costs of production, as Mrs. Somerville requested the reproduction of more and more woodcuts in the volume.

tion of Sir John Herschel.¹⁰⁵ The reviews¹⁰⁶ did, in fact, tend to be kindly rather than laudative. In the end, Mrs. Somerville wrote that she thought its publication had been a mistake,¹⁰⁷ although she hopefully prepared a second edition "should it be called for".¹⁰⁸

From 1833 onwards the Somervilles made frequent and long stays on the Continent—in Paris, Munich and in cities throughout Italy. Dr. Somerville's health required a warm climate at a time when "through the treachery of persons in whom we trusted",¹⁰⁹ their capital was lost and their income thereby reduced. Italy offered a pleasant life for English expatriates, so it was there that the family settled in the 1840's. Father, mother and two unmarried daughters moved about the peninsula as season, health, fancy or need dictated; never again did they have a permanent home. Trips back to England and to Scotland became rarer and rarer, though letters and visits from British friends kept them for a long time a part of the home scientific scene. Woronzow Greig, now a successful London barrister, acted for his mother in England and served as a channel for the exchange of much scientific as well as family news. The Somervilles became a permanent and spirited part of the Italian scene during the *risorgimento* and of the brilliant English colony that from the mid-nineteenth century made Italy a second home.¹¹⁰

Some of their early philosophical friends—Davy, Young and Wollaston—had died before the publication of *The Mechanism of the Heavens*, but many others—among them Faraday, Herschel, Whewell, Brewster, Airy, Babbage, Lord Rosse, W. H. Smyth, Murchison, Lyell, Sedgwick,

¹⁰⁵ Asked to read the manuscript, Sir John, in a letter to Martha Somerville dated 3 January 1867 (Somerville Collection), makes a number of tactful suggestions about the rewording of confused passages and the reduction of detailed material, as well as correcting spelling errors, altering the style occasionally, and advising the removal or rewriting of some passages. After these changes he was able to assure Murray that the portion of the work on the constitution of matter was acceptable and an editor (Thomas Moore, the horticultural expert and writer) was hired to read the second part, with the stipulation that any changes he made must have Mrs. Somerville's approval. The book finally appeared in January 1869, its preface carrying the author's thanks to Sir John, Moore, John Tyndall, Gwyn Jeffrey and "Mr. Huggins" (probably William Huggins, the astronomer), "... who have aided in revising some of the sheets for the press..."

¹⁰⁶ *The Saturday Review* (London, 13 February 1869, 219) begins its article on the book with the sentence, "Among the many marvels of nature which Mrs. Somerville has made it her task through life to expound or illustrate, she might herself, to our thinking, be set down as by no means the least worthy of the mark", but later on comments that "... she has not got so far as the strict modern view of matter", referring to "her rhetorical view of the atom". Sir H. E. Roscoe, reviewing the book for the *Edinburgh Review* (cxviii, July 1869, 137-163) pays tribute to its publication as "... a case without parallel in the annals of science..." and gracefully refers to Mrs. Somerville's 80 years, then tactfully deplores her failure to place the principle of conservation of energy, "the keystone upon which the structure of modern science rests... so prominently in the foreground of her work as might be advisable".

¹⁰⁷ Somerville, *op. cit.* (9), 338.

¹⁰⁸ This manuscript is in the Somerville Collection.

¹⁰⁹ Somerville, *op. cit.* (9), 178.

¹¹⁰ The 8th Duke of Argyll has an interesting account of his meeting with Mrs. Somerville in Rome during the winter of 1844; he became a devoted friend (see *Autobiography and Memoirs of George Douglas*, 8th Duke of Argyll, K.G., K.T., edited by the Dowager Duchess of Argyll (London, John Murray, 1906), i, 255-257).

Darwin, Pentland, Keith Johnston and Tyndall—continued to give scientific help and information for many years. Mary Somerville outlived them all save five—Airy, Darwin, Lyell, Sedgwick and Tyndall. In Italy she was warmly welcomed to scientific circles wherever she went and offered access to libraries¹¹¹ and observatories,¹¹² but the work being done there and many of the available facilities were sadly inferior to those she had known in London as part of her daily life. Preparing a manuscript, its transportation to England and seeing it through the press depended more and more upon the assistance of friends and relatives. Letters of inquiry, requests for books, notes of thanks for articles, papers and small favours make up a great part of Mrs. Somerville's correspondence in her last decades. Her later prefaces refer frequently to "the disadvantages under which the author labours, of a residence abroad, and at a distance from libraries of reference",¹¹³ coupled with personal thanks to various people for "superintending the passage through the press of this work during the author's residence abroad".¹¹⁴

She did manage to keep up with current scientific work, though after 1850 the bold advances were no longer being made principally by members of her own intimate circle. Joule, Clerk Maxwell, William Thomson, Becquerel—these men¹¹⁵ were known to her through reports and papers, not as dining companions or fellow-guests at house-parties. Without complaint but with frequent nostalgia, her letters note how she misses the stimulation of the London scene and first-hand information about scientific matters. In her last years—widowed, saddened by the death of her beloved son, quite deaf, her hands shaky, yet with keen vision, mentally alert and still interested ". . . in reading about all the new discoveries and theories in the scientific world, and on all branches of science",¹¹⁶ she wrote her autobiography, recalling with gaiety and verve much of her remarkable life. After her death on 29 November 1872 parts of this manuscript were arranged by her elder surviving daughter and published under the title *Personal Recollections from Early Life to Old Age of Mary Somerville*.¹¹⁷ Her life as a child at Burntisland, as a young lady in Edinburgh, and as a wife and mother in London and Italy make fascinating reading and give a lively, first-hand picture over a span of almost a century. Though she was "averse to gossip and to revelations of private life

¹¹¹ Including the private library in the Pitti Palace of the Grand Duke Leopold II of Tuscany. See Somerville, *op. cit.* (9), 234.

¹¹² *Ibid.*, 240. R. A. Proctor, in his obituary notice for Mrs. Somerville (see *Royal Astronomical Society Monthly Notices*, xxxiii, 4 February, 1873, 190-197) says that Mrs. Somerville, then in Italy, was "... debarred the sight of the ... comet of 1843 ... [because] the only Italian observatory which afforded the necessary implements was in a Jesuit establishment, where no woman was allowed to pass the threshold".

¹¹³ Preface to *On Molecular and Microscopic Science*, *op. cit.* (102).

¹¹⁴ Introduction to *Physical Geography*, 3rd ed. (1851), *op. cit.* (86).

¹¹⁵ No letters from any of them have as yet been found in the Somerville Collection.

¹¹⁶ Somerville, *op. cit.* (9), 364.

¹¹⁷ *Ibid.*, 377 pages.

or of intimate correspondence",¹¹⁸ her accounts of various notable events and of her own extraordinary life in science are highly interesting, both because they deal so often with names well-known in Britain, on the Continent and in America, and because Mrs. Somerville was for so many years a part of a far-flung intellectual community which she observed carefully and about which she wrote with accuracy and skill. Her autobiography, as well as her letters and personal papers, have value not only for the historian of nineteenth-century science but also for the social, literary, economic and political historian.

Clarity and a gift for organizing masses of specialized information into short, lucid accounts are the outstanding features of her scientific writings. She was an expositor of science rather than a popularizer of science. In all her scientific books her chief purposes are alike and clear-cut: (i) to present an account of "the present state" of the science, together with whatever background material, definitions, diagrams and drawings are necessary to render it understandable to any tolerably educated reader and (ii) to show various important connections or dependences between that "present state" and other knowledge. In doing so she uses in almost every instance the vocabulary and terminology of the advanced scientific practitioners of the time. Her style is simple and direct, uncoloured—save for occasional passages in the last two editions of *Physical Sciences*—by a Victorian need to preach or prettify. References to recent work and to those who have done it are frequent. Her praise is generous and genuine. When views are conflicting, all proffered explanations of phenomena are presented; when resolved, discredited ideas drop out unobtrusively. Hypotheses are carefully labelled as such and the significance of experimental findings in supporting or disproving them clearly pointed out. No tinge of nationalism flaws her judgement; the work of the whole community of scientists is her province. In many respects Mrs. Somerville is a model scientific writer.

Kuhn has pointed out that science textbooks today recount ". . . research firmly based upon one or more past scientific achievements . . . that some particular scientific community acknowledges for a time as supplying the foundation for its further practice" and that these books, which ". . . expound the body of accepted theory, illustrate many or all of its successful applications, and compare these applications with exemplary observations and experiments . . . became popular early in the nineteenth century".¹¹⁹ Mrs. Somerville's work fits in large measure this pattern. In no sense handbooks or manuals of directions and never aimed at teaching a syllabus, they nonetheless emphasized experimental findings and relied heavily upon description of pertinent experimental work,

¹¹⁸ *Ibid.*, 1.

¹¹⁹ Thomas S. Kuhn, *The Structure of Scientific Revolutions* (Chicago, University of Chicago Press, 1962), 10. "Textbook" is used in the American sense.

along with its theoretical explanations and suggestions of possible significant developments.¹²⁰ The coverage of her books, particularly of *Physical Geography* and *Molecular and Microscopic Science*, is encyclopaedic. Though clearly written, their contents provide no easy reading over long stretches of time and their reader is rarely given respite from a steady barrage of well-organized facts.

Her books were published, of course, during a period in which scientific writings were aimed at a much larger segment of the general public than ever before and when such discourses found ready audiences.¹²¹ Popular lectures, demonstrations, treatises, public comment and—especially among growing numbers of the working classes—actual daily contact with a developing technology and its fruits—all kept science and its innovations constantly before a rapidly industrializing society. David Brewster, who with Babbage in the early 1830's deplored the decline of a taste for ". . . science . . . among the educated classes, and . . . [of its] patronage among the upper ranks", wrote

"It is not easy to devise a cure for such a state of things; but, in addition to some legislative enactments . . . the most obvious remedy is to provide the educated classes with a series of works on popular and practical science, freed from mathematical symbols and technical terms, written in simple and perspicuous language and illustrated by facts and experiments which are level to the capacity of ordinary minds."¹²²

The volumes of the *Cabinet Cyclopaedia* carried these words on their frontispieces, where they were more appropriate, in at least one respect, than they would have been to introduce the works of Mrs. Somerville. She maintained a level of sophistication, along with a clarity and cogency of style, almost invariably superior to most popular scientific writing;¹²³ the rigour of her presentations, which won the approval of most of the scientific

¹²⁰ Reference has already been made to Mrs. Somerville's ability to look into, in Maxwell's happily chosen phrase, "... the depths of futurity". *Op. cit.* (71).

¹²¹ An increased awareness both of science and of mass education in the first half of the nineteenth century gave rise to a number of dictionaries, encyclopaedias and "libraries of literature, science and the arts", among them Sir David Brewster's *Edinburgh Encyclopedia*, Brougham's Library of Useful Knowledge, Lardner's *Cabinet Cyclopaedia*, Rees' *Cyclopaedia*, and the *Encyclopaedia Metropolitana*. All were frequently distinguished by articles from the pens of outstanding scientific men of the day.

¹²² David Brewster, "Art. VI. A Treatise on Sound. By J. F. W. Herschell [sic], Esq., F.R.S. London and Edinburgh, &c. (In the *Encyclopaedia Metropolitana*.) Lond. 1830", *Quarterly Review*, xlv (February 1831), 476.

¹²³ The volumes of the *Cabinet Cyclopaedia* were written by different specialists, hence comparisons between these works and Mrs. Somerville's books are useful only within narrow limits, although identical topics are often covered in both. If a generalization may be risked, it is that her works are more informative and synthetical about the larger issues of scientific theory, experimentation and possible future developments, while the *Cabinet* volumes tend to be more explicit in their descriptions of apparatus and its use. Emphasis is always put by Mrs. Somerville on quantification and upon the newest views and discoveries. Compare, for example, her treatment of "chemical affinities" (*op. cit.* (59), 102-103) with its accent on electrical aspects and on Dalton's quantitative laws with Lardner's (see Kater and Lardner, *A Treatise on Mechanics* (London, 1837), 73-74) in which neither of these points is mentioned.

community, was often the despair of her publisher¹²⁴ and of some well-educated readers.¹²⁵

All of the books—except *The Mechanism of the Heavens*, whose design was already largely settled by Laplace and which is so limited in its scope, compared with her other works, as to be atypical—stress the interconnections, in the sense of interdependences, found in nature and in the study of natural phenomena. The quotation from Francis Bacon appearing on the title page of some of the editions of *Physical Sciences* typifies her aim in writing that book, as well as her others: “No natural phenomenon can be adequately studied by itself alone—but, to be understood, it must be considered as it stands connected with all nature.” She early recognized, according to Maxwell,¹²⁶ “. . . [a unity which was] a unity of the method of science, not a unity of the processes of nature”. Again and again, in successive editions of this work, she points out in her prefaces that the “. . . progress of modern science . . . has been remarkable for a tendency to simplify the laws of nature, and to unite detached branches by general principles”.¹²⁷ Similarly, in the case of *Physical Geography*, her desire is to demonstrate how physical reasons account for topography and to combine physical geography with consideration of geological history and natural phenomena—all given in scientific terms and all based on the work of scientific observers. In *Molecular and Microscopic Science* she unites an exposition of the smallest units then recognized in the material universe (atoms) with the smallest units she knew in the animal and vegetable worlds (microscopic animals and plants).

That Mrs. Somerville so well achieved her goals was due not only to her own undoubted talents and considerable learning but also to her scientific consultants, possibly the most distinguished corps that any author ever commanded during a lifetime. From an examination of some of the letters and papers in the Somerville Collection at Oxford, it is clear that her scientific interests and efforts always met with a generous and attentive response from the London scientific body. When she began her writing, this response was manifested in very concrete terms: some of the outstanding scientific philosophers of the day became in a sense her collaborators. They explained to her the theories and problems of their special fields of competence, supplied her with relevant and important

¹²⁴ Both Murrays on occasion expressed concern lest Mrs. Somerville lose the “general reader” and urged her to write at a less demanding level. Herschel, in agreement with Murray on this point in the discussions about *Molecular and Microscopic Science*, put the argument very well when he wrote (*op. cit.* (105)) that too technical a presentation dismayed the ordinary reader while those greatly interested consulted the authorities cited. Proctor (*op. cit.* (112), 195) speaks of her efforts “. . . to please Mr. Murray . . .” by popularizing her text.

¹²⁵ George Eliot in a letter to Maria Lewis dated 23 June 1840 says, “My excuse shall be a state of head that calls for 4 leeches before I can attack Mrs. Somerville’s *Connexion of the Physical Sciences*”. See *The George Eliot Letters*, edited by G. S. Haight (Oxford University Press, 1956), i, 56.

¹²⁶ Maxwell, *op. cit.* (71), 402.

¹²⁷ Somerville, *op. cit.* (59), all editions, preface.

readings, answered her queries, then read and corrected her manuscripts. Example after example are to be found of this sort of expert help—from Kater, Babbage, Airy, Baily, Whewell, Murchison, Lord Rosse, Brewster, Lyell, Basil Hall, Baden Powell and many others. Wollaston rewrites a paragraph explaining a geometrical construction,¹²⁸ suggests that certain material be omitted from a manuscript dealing with the transmission of light because “. . . doubtful matter dilutes & mars the merits of a good cause” and, struck by one of her usages, observes, “I know what you mean, but the term is either Lady-like or Scotch”.¹²⁹ Sir John Herschel is a voluminous correspondent at all times, checking her manuscripts, advising her where to find the newest and most reliable information, encouraging her to persevere in the face of difficulties, and in three instances—*The Mechanism of the Heavens*, *Physical Geography* and *On Molecular and Microscopic Science*—being the decisive factor in persuading her or John Murray to bring out the book.

Of particular interest among these letters are some from Michael Faraday, a good friend and great admirer of Mrs. Somerville. She apparently consulted him on many points during the preparation of *On the Connexion of the the Physical Sciences* and its subsequent editions. Pages of detailed notes in Faraday's hand refer to specific lines in her manuscript. For example, a short letter dated November 1833, addressed to Dr. Somerville, reads

“I just wrote down at the moment whatever/occurred to me. Do not therefore think me too free but treat/these remarks quite as freely/and oblige/Yours Very Truly/M Faraday/My best respects to Mrs. Somerville.”

and accompanies four large sheets of comments, each comment relating to a specific line on a specified page of the manuscript. These notes can be collated with sentences in the chapters on electricity and magnetism in the first edition of this book. Faraday in them not only corrects mis-statements in the manuscript and suggests more suitable wordings, but in so doing often writes a few lines explaining why he has advocated such changes. His remarks, for instance, on

“page 282 at bottom: I think it doubtful whether the attractions and repulsions can thus be referred directly and mechanically to the pressure of the air which is of course implied by pressure upon the air. I think Electricians have hurried the science here and given a clumsy mechanical view because they do not perceive a better.”¹³⁰

results in the following statement in the published text:

“It has been supposed that . . . when two bodies are charged with opposite electricities . . . that the pressure upon the air on the adjacent sides will be increased by the mutual attraction of the particles of the electric fluid, and that on the further sides diminished; consequently that the force will urge the bodies towards one another, the motion . . . corresponding to the forces producing it. An attempt has thus been made to attribute electric attractions and repulsions to the mechanical pressure of the atmosphere; it is, however, more than doubtful whether these

¹²⁸ W. H. Wollaston to Mrs. Somerville, 19 March (no year) (Somerville Collection).

¹²⁹ W. H. Wollaston to Mrs. Somerville, 4 January 1826 (Somerville Collection).

¹³⁰ Michael Faraday to Dr. Somerville, November 1833 (Somerville Collection).

phenomena can be referred to that cause, but certain it is that, whatever the nature of these forces may be, they are not impeded in their action by the intervention of any substance whatever, provided it be not itself in an electric state."¹³¹

Faraday's uneasiness over a mechanical explanation in this case was a forerunner of his refutation¹³² in 1838 of the pressure view of Poisson and Biot and consistent with his gradually developing ideas about force fields and action at a distance.

Example after example of this sort can be found in *Physical Sciences* by collating text and notes not only from Faraday but from many other correspondents. It appears that Mrs. Somerville in presenting "the present state" of a science made sure that its outermost frontiers should be included by having her work scrutinized by experts and then revising it before publication to bring it in line with their current thinking. An examination of her treatment of electricity and magnetism in successive editions of *Physical Sciences* discloses that all important changes during the mid-nineteenth century in these topics are reflected, including among others the abandonment of the fluid theories, the growing conviction that electricities produced by different means were identical, the unfolding of the relationship between electricity and magnetism, and the widening application of electrical theory and techniques to chemical problems. Other topics examined show the same high degree of relevance to the advanced scientific views held at the time of publication. New developments, such as those in photography, and new ideas, such as those on conservation relations, appear at the proper time and, in succeeding editions, gain increasing attention. The close working relationship between Mrs. Somerville and many of the most innovative and profound scientific minds of the period produced books which should not be overlooked in any investigation of nineteenth-century science; her works offer an authoritative account of much of the scientific thinking of the time.¹³³

Against the background provided by her correspondence and the

¹³¹ Somerville, *op. cit.* (59), 225.

¹³² Michael Faraday, "Paragraphs 1377 and 1378", *Experimental Researches in Electricity*, 2nd ed. (London, 1849), i, 438-439.

¹³³ During her lifetime, Mrs. Somerville was venerated as a scientific authority. An amusing display of the regard in which she was held is afforded by a small pamphlet in the Yale University Library (New Haven, Connecticut). The brochure seeks to encourage the purchases of stock in the "Electro-Magnetic Association" formed to finance the further development and patenting of "Davenport's Electro-Magnetic Machine", a rotary magnetic device invented by a Vermont blacksmith, Thomas Davenport, in 1834. Less than half the booklet is given over to a history of the inventor and his invention, excerpts from newspaper accounts praising the invention and an endorsement by Prof. Benjamin Silliman of Yale that had appeared in his *American Journal of Science and Arts*. Its remaining sixty pages are a reprint—no doubt pirated—of the material on "Electricity, Galvanism, Magnetism, Electro-Magnetism, Electro-Dynamics, Magneto-Electricity, Experiments by Arago and others, Terrestrial Magnetism &c., and Explanation of Terms" from the first edition of Mrs. Somerville's book. "As Electricity and Magnetism are comparatively modern sciences", reads the introduction to the booklet, "and that of Electro-Magnetism is of very recent origin, we have made copious extracts from the able treatise of Mrs. Somerville, 'on the connexion of the Physical Sciences', for the information of those who have not time or inclination for researches in more elaborate works". The pamphlet was published in New York in 1837 by G. & C. Carvill & Co. and G. F. Hopkins and Sons.

personal papers in the Somerville Collection, Mary Somerville's books and her career take on a new depth. The Collection is not yet catalogued, so a full and definitive assessment of its value and usefulness cannot be made at this time. The author has, however, examined every item in it at least briefly and many with thoroughness, and estimates that it contains well over ten thousand different pieces. These include completed manuscripts, manuscript drafts, notes, notebooks, letters, diaries, business papers, personal papers and memorabilia. The general headings under which it is stored in the Bodleian Library are (i) manuscripts, diaries, etc.; (ii) Dr. Somerville's papers; (iii) family (Fairfax, Greig and Somerville) papers; family and private correspondence; (iv) presentations, awards, memorabilia; (v) business matters, principally between Mrs. Somerville and Murray; (vi) "letters from celebrities", including the bulk of the scientific correspondence in the Collection. These categorizations can give only a hint of the wealth of material that is encompassed; to gauge its importance a careful study in detail must be made. A few comments on two of the headings above—letters from celebrities and manuscripts—may indicate the type of material to be expected and suggest some interesting areas of exploration.

The letters—several hundred of them from almost two hundred different correspondents—were arranged by Mary Somerville before her death. She prepared makeshift folders of coarse grey paper and sorted the letters into a rough alphabetical order. On the outside of each folder she attempted to indicate the correspondents therein by listing their names and often a few word of identification or explanation. Some lists are incomplete. The handwriting is hers, shaky with age and at times illegible.¹³⁴ The spelling—never her *forte*—is erratic and the punctuation interesting. The flavour and calibre of her correspondence can be demonstrated by her entries under "A" and "B"—chosen as typical of the whole and transcribed below as they appear on the folders.

A

Ampere who discovered thermo-electricity
 Airy astronomer Royal at Greenwich
 Arago astronomer & various branches of Science Paris
 Antioni & Amici the microscopist Italy
 Argyll
 Astell

B

Revd Hugh Blair Edinburgh
 Lord Brougham on the Mechanism of the Heavens—my dedication of the
 Physical Sciences to the Queen wife of William 4th and various mathematic
 papers

¹³⁴ The handwriting of her correspondents is often equally unreadable.

Biot the celebrated French astronomer
 Balbi the geographer
 Beaufort Admiral & Hydrographer to the RN enclosing Mr. Peter of Liverpools
 letter about the Mary Somerville Chinaman¹³⁵
 Beaufoy Colonel
 Buckland Revd W [illegible] & Geologist &c.
 Babbage Charles the calculating machine
 Bailey who determined the density of the earth
 Birbeck scientific¹³⁶
 Brodriss Scientific animal life &c
 Bouvard the French philosopher
 Bowditch US LaPlaces work explained¹³⁷
 Bunbury Sir Henry historian
 Back Sir George the Arctic traveller
 Butler Fanny Kemble
 Berry Miss author of Manners in France & England &c &c &c
 Baillie Joanna Poet Tragedies on the Passions sisters & brother
 Barbault Mrs Author
 Byron Letters from Lady Noel Byron
 Byron Ada Augusta letters before & after her Marriage
 Boole¹³⁸
 Barth Adolph¹³⁹
 Miss Brown Ivehall Exeter a self educated mathematician like myself
 Sir David Brewster
 Mrs. Baker my niece giving an account of Sir David Brewster's death
 deBalbiac
 Barnes¹⁴⁰
 Baxter¹⁴¹
 Beccano
 B—— [illegible; possibly Beickonsoff, Beickommoff, Bleckompoff or
 Beckedorff¹⁴²]
 Marion Bell
 Blackwell¹⁴³
 Blunt
 Brown Montagu¹⁴⁴
 Buller¹⁴⁵
 B—— [illegible; possibly Burr or Barr]
 Butena

¹³⁵ The *Mary Somerville*, a vessel built for the China and India trade, disappeared on her maiden voyage, presumably lost in a typhoon in the China Sea.

¹³⁶ The letter is from George Birkbeck.

¹³⁷ Nathaniel Bowditch of Boston, U.S.A., author of a famed book on navigation and an excellent translation of Laplace's *Mécanique céleste* (1829-1838). Both he and his son Henry were among Mrs. Somerville's American correspondents. Letters from almost a score of Americans are found in the Somerville papers.

¹³⁸ George Boole (1815-1864), professor of mathematics in Queen's College, Cork.

¹³⁹ Dr. Barth translated *Physical Geography* into German.

¹⁴⁰ Thomas Barnes, editor of *The Times*.

¹⁴¹ Sir David Baxter, wealthy linen manufacturer of Dundee.

¹⁴² Mme. Beckedorff was a member of Queen Charlotte's household in England and old friend of Caroline Herschel; they spent their last years in Hanover.

¹⁴³ Dr. Elizabeth Blackwell, the first American woman M.D. She lived in London after 1868 and treated some Somerville relatives.

¹⁴⁴ Montague Brown was British consul at Genoa in 1865.

¹⁴⁵ Charles Buller, M.P.

Byron autograph
Beck
Berkley M J
Brenzoni Signori ¹⁴⁶
Butler Josephine ¹⁴⁷
Bronson Charles

Not all of her correspondence from celebrities is found in such folders, for much of the private and family correspondence originated with figures of some importance at the time. Mrs. Somerville's life was so full, so long and touched so many circles that arrangement of her papers in any number of orders—alphabetically, geographically, chronologically, professionally, even by sex of correspondent—provides in each case a different but rich harvest of material.

A consideration of the Collection raises a number of questions to which, at the moment, only tentative answers can be proffered. Why, for example, was Mrs. Somerville so insistent that "Darwinism" should not appear in any edition of her scientific books,¹⁴⁸ though she aimed always to present "the present state of science"? She knew and admired Darwin,¹⁴⁹ referred frequently in her *Physical Geography* to his travels and his work as a naturalist, and approved the choice of H. W. Bates¹⁵⁰ to revise that book for its sixth edition (1870), on the assurance that he would not "infuse any Darwinism in it". The explanation may be the simple one that she was not convinced by Darwin's theory, which she described in rough autobiographical notes as "imperfect, for he does not explain the origin of the varieties of first organic forms . . .", or it may lie in three shadowy incidents¹⁵¹ in which she herself was publicly denounced for her scientific

¹⁴⁶ The Countess Bon-Brenzoni was an Italian poetess. Among her works is a long poem on modern astronomy (*I Cieli*) that includes some verses in praise of Mrs. Somerville. See Somerville, *op. cit.* (9), 297-299.

¹⁴⁷ Josephine Butler was an ardent advocate of woman's rights.

¹⁴⁸ Letters in the Collection to Mrs. Somerville from her old friend the geographer J. B. Pentland (11 January 1869) and from Murray (9 January 1869 and 21 January 1869) assure her that "no Darwinism" will appear in the projected new edition of *Physical Geography*, the second since the publication of Darwin's *On the Origin of Species by Means of Natural Selection* in November 1859. In that year Murray sent her a copy of this book (now in the possession of Somerville College) along with his Christmas greetings. Preserved among the memorabilia of the Collection and marked with the three pencilled asterisks which Mrs. Somerville used to denote material of special significance is Huxley's long review of the work, clipped from *The Times* of 26 December 1859.

¹⁴⁹ Several letters from Darwin are in the Somerville Collection and he generously permitted her to use woodcuts from his book on orchids as illustrations in *Molecular and Microscopic Science*.

¹⁵⁰ Bates, close friend and colleague of A. R. Wallace, is described (*DNB*) as "a staunch and thoroughgoing adherent of the Darwinian hypothesis". His *Naturalist on the Amazons* (1863) was written largely because of the urgings of Darwin, who found Bates's material, particularly that on mimicry, valuable. Murray had been responsible for Bates's appointment in 1864 as assistant secretary of the Royal Geographical Society.

¹⁵¹ Among Mrs. Somerville's autobiographical notes is an account of her public denunciation in the House of Commons by "... Mr. Buller member of some place I have forgotten in the west of England . . ." [possibly Charles Buller, at the time M.P. from the Cornish borough of West Looe], following the publication of *The Mechanism*, and her speedy subsequent defence by

writings and which may have given her a dread of further public controversy, despite her past outspoken support of several unpopular scientific views¹⁵² and her championing in Italy of insurgent political causes.¹⁵³ Her stance in this case may be indication of the degree of disquiet Darwinism stirred among apparently advanced scientific thinkers.

Further study of her autobiography may provide insight into this puzzle and others. Two drafts of the autobiography are among the Somerville papers, one in Mary Somerville's hand, and the other (it seems) in the hand of her daughter Martha. The second one has been re-arranged and annotated by Mrs. Somerville and appears to have served as the copy from which *Personal Recollections* was prepared. Parts of it have been mutilated but it corresponds closely to text in the published version. Fortunately almost all the passages in this draft which have been heavily marked through or physically removed are to be found in the first draft. The changes¹⁵⁴ appear to have been made solely on the basis of the taste of the 1870's. Mrs. Somerville had, after all, passed over half her lifetime in a social climate flavoured by the eighteenth century and she retained a certain gusto and outspokenness¹⁵⁵ that had gone out of fashion. Both Mrs. Somerville's daughters were well over fifty when she died; they had little money and little opportunity to earn any. Martha, the elder, wished to put together a volume that would do justice to her much-beloved mother but that would also sell. She had the expert advice of Frances Power Cobbe, a successful journalist, essayist and ardent feminist who had become a close friend of the family in Mrs. Somerville's later years. From letters in the Collection, it is clear that Miss Cobbe did a good part of the editing of *Personal Recollections* and that she and Murray set the tone of the editorial commentary and insisted upon the inclusion of letters from persons popular at the moment rather than attempting a definitive life. The Mary Somerville who emerges from the pages of *Personal Recollections* is slightly distorted from the fascinating

¹⁵² See (73) and (74).

¹⁵³ Somerville, *op. cit.* (9), 310-325.

¹⁵⁴ Typical of the changes is the physical excision of the words "Roman Catholic" from a page of the second manuscript draft.

¹⁵⁵ "The wine is here and is delicious—a thousand thanks to you now a teetotler which I shall never be", wrote Mrs. Somerville to her son taking the cure at Bath. "I never drank water in my life and have no intention of ever doing so as long as you supply one with such sherry." Letter from Mary Somerville to Woronzow Greig, 13 June 1863 (Somerville Collection). Comments of this sort were not considered appropriate for inclusion in *Personal Recollections*.

Henry Warburton, M.P. from Dorset, whom she reports as saying, "Mr. Speaker I have read the book . . . & I can only say that there are not more than 5 men in Great Britain capable to have written it." After the appearance of *Physical Geography* she was again denounced in the House of Commons and also from the pulpit of York Minster, this time for her support of the "geologists' views" of the age of the earth. A note with the copies of the book owned by Somerville College (2nd, 3rd and 6th editions) says, "The publication of the book led to a scene in the House of Commons and fulminations from pulpits."

woman of the autobiography and still more different from the one disclosed when autobiography, letters and papers are studied together and at this distance in time.

Whatever may be revealed by a detailed examination of the Collection, we have Mary Somerville's own touching, unexpected and very different view of her life. Tucked between the pages of a volume¹⁵⁶ of Whewell's *History of the Inductive Sciences* inscribed to her by its author, is a scrap of paper covered with writing in a hand so shaky with age as to be almost illegible. Mary Somerville on it has jotted down some of the things that she recalled as important in her life. It reads:

Born 26 Decr 1780
 Went to school at 10 returned when 11
 At Dancing School when 12¹⁵⁷
 Reed¹⁵⁸ in the learning when 13 stude in Edn & Home¹⁵⁹
 Piano writing & arithmetic I like
 Uncle Wm¹⁶⁰ at 14 dancing
 Algebra when 15 one winter visitor at Nasmyths¹⁶¹
 Craw¹⁶² gets Euclid at 16
 At this time in the end of the last century the
 Mathematical and physical science had made
 rapid & great progress in france notwithstanding
 the revolution In England mathematical science
 was far behind for the English philosophers followed
 Newton in using fluxions while in France Liebnitz
 method of differentiating (universal was used¹⁶³) the far more
 powerful
 I was 8 years old when the French revolution began
 13 when the King was beheaded
 15 when at Dunnikeir¹⁶⁴

¹⁵⁶ This volume, along with 125 others that belonged to Mary Somerville, were presented to the "Ladies College at Cambridge" (Girton College) by the Misses Martha and Mary Somerville in 1873, after their mother's death. Most of these volumes are inscribed to Mrs. Somerville by their authors. Somerville College, founded in 1879 and named "in honour of Mary Somerville, the mathematician, . . . [whose family] arms and motto were adopted by the College", has a number of books that belonged to Mrs. Somerville and members of her immediate family, as well as portraits, some of her paintings, letters and memorabilia.

¹⁵⁷ The school was conducted by Mr. Strange, who "... wore a powdered wig, with cannons at the ears, and a pigtail", and was held in the public assembly rooms in George Street, Edinburgh. Somerville, *op. cit.* (9) 41-42.

¹⁵⁸ Reed was the village schoolmaster who taught Mary Fairfax astronomy and geography for a few hours one winter.

¹⁵⁹ The word is almost illegible. It may be a reference to Burntisland or to the playwright, John Home, who was a friend of Margaret Charters Fairfax and whom Mary Fairfax met one winter in Edinburgh, or it may be still undeciphered.

¹⁶⁰ During this Edinburgh period Mary Fairfax lived at the home of her mother's brother, William Henry Charters, who had returned to Scotland from India.

¹⁶¹ Alexander Nasmyth, a landscape painter, opened an academy in Edinburgh to teach young ladies painting. It was he who suggested that his pupils study Euclid. See (18).

¹⁶² See (19).

¹⁶³ The words in the parentheses are doubtful; the rendition is the best guess from the writing.

¹⁶⁴ Dunnikeir was the home of the Oswalds, whose youngest daughter was Mary Fairfax's age. She married the Earl of Elgin and was the mother of Lady Augusta Stanley, wife of the Dean of Westminster (see (73)). Mary Fairfax spent Christmas at Dunnikeir when she was 15 years old.

16 gay, balls, cookery, parlors at home
Maskalyne, Bradley, Herschel in England great
Geology at a low ebb, Sir James Hall
Mineralogy in Germany, in France Haüy, Jameson
in Scotland—I was totally ignorant of chemistry I had never heard the name.

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