

PRESIDENTIAL ADDRESS†

Does the history of science have a future?

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It has been a singular privilege to preside over the BSHS as it celebrates its fiftieth anniversary. As we share our festivities with the British Association annual meeting at Leeds, I am doubly honoured to be giving this address. A fiftieth anniversary is a sentimental occasion. It is a moment when we can express our gratitude to our many friends and forebears who by their dedication have enabled the Society to grow and flourish. That so many of those friends should be with us to share in our celebration is a source of delight to us all. To our past presidents, former editors, officers and councillors, I extend the warmest welcome. And to our visitors and guests from overseas, I should like to say how much we value your presence and contribution to this conference.

Is there not, then, an incongruous note in my title – a hint of foreboding perhaps? If tempted to speculate on its source one might have wondered whether it is in those rumours we sometimes hear that the end of science is nigh.¹ When we can almost clone humans and almost explain the moment of creation, what is there left? Might the end of science not spell the end of its history? A moment's reflection suggests that this cannot be. After all, the question why science should have come to an end when it did would still keep historians in business. And the more intriguing question of why the end of science has been proclaimed at the end of each of the last four centuries would keep us in business even longer!

The wells of foreboding might be located elsewhere. Is there any longer a single recognizable discipline of the history of science, which would make it possible to speak of its future? Has there not been such a proliferation of methodologies and practices in the arena of science studies that we are left with a sense of fragmentation, even disintegration? This is an issue that merits discussion; but it is not the issue that prompted my question. After all, the sciences themselves have coped with a fragmentation that was diagnosed long ago. That illustrious Lancastrian William Whewell – arguably the patriarch of our discipline – coined the word 'scientist' to bestow some unity on a fragmented culture. 'The

† *Editor's note.* This address was delivered at the University of Leeds on 9 September 1997 as part of the 50th Anniversary Conference of the BSHS, held in conjunction with the British Association for the Advancement of Science. The proceedings of the BSHS conference will be published as a BSHS Monograph.

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1 J. Horgan, *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age*, London, 1996.

mathematician', he wrote, 'turns away from the chemist; the chemist from the naturalist; the mathematician, left to himself, divides himself into a pure mathematician and a mixed mathematician, who soon part company; the chemist is perhaps a chemist of electrochemistry; if so, he leaves common chemical analysis to others.'² A familiar story. But if subdivision and disaggregation were preconditions of progress in the sciences why should they not be in the history of science? And though the scientist may turn away from the sociologist, the philosopher from the anthropologist, the historian surely has a future in keeping them on speaking terms?

A threat of disintegration might come from another quarter. There was a time when it was easier to detect a certain unity of direction and aim in historical inquiry. Addressing the Fifteenth International Congress of the History of Science in Edinburgh in August 1977, Joseph Needham advised that 'we must never deny the fundamental continuity and universality of all science'.³ Different pieces of the jig-saw of knowledge had originated and been shaped in different cultural contexts; but there was the big picture on the box that would eventually be realized. This gave to the history of science a unity of direction in the reassembly of the pieces and a unity of purpose in its ecumenical attitude to other cultures. The problem, as Needham himself observed, was that the picture on the box kept changing with time. But this was a problem that he could also turn to advantage, suggesting that 'the thought complex of traditional Chinese science may yet have a greater part to play in the final state of all science than might be admitted if science today was all that science will ever be'.⁴

There is, nevertheless, an issue here that might have produced foreboding. As the history of science has become the history of 'science in context', the image of the jig-saw, the belief in that 'final state of all science' has surely receded. Whereas the pieces of a jig-saw are additive, it is not clear how local contexts can be. And, if the history of science becomes a history of the differentiation of contexts, if we stress the permeability of the boundaries with which the word 'science' has been ringed, does the subject not simply dissolve into fragments of socio-cultural history? This might be a source of foreboding for a pessimist or indeed for anyone faced with the daunting task of synthesizing recent scholarship.⁵ But if *the* history of science has no future, histories of different sciences in their different local contexts surely still have a bright one. As scholars in the field we can map the multiple spaces in which the sciences have taken shape and we can relish the differentiation. Is our relish, however, shared by our publics?

This brings me to the concern that did prompt my question. An advantage we have as historians is that, unlike Mrs Malaprop in Sheridan's play, we can anticipate the past and see the future in retrospect. A fiftieth anniversary is the perfect moment to do so. The concern lodged in my title is one voiced in Leeds some thirty years ago when Rupert Hall gave his presidential address to the Society. His question was one that has received a

2 W. Whewell, Review of Mary Somerville's *On the Connexion of the Physical Sciences*, *Quarterly Review* (1834), 51, 54–68, on 59.

3 J. Needham, 'Address to the opening session of the XV International Congress of the History of Science, Edinburgh, 11 August 1977', *BJHS* (1978), 11, 103–13, on 111.

4 Needham, *op. cit.* (3), 112–13.

5 The problems here were explored in 'The Big Picture', a special issue of *BJHS* (1993), 26.

ringing answer in the succeeding interval: ‘Can the history of science be history?’⁶ His address marked a poignant moment in the growth of our discipline. From having been largely subsumed under the culture of the sciences, there was the lure of a heady future in which it would become integral to the culture of history. But there was another crucial issue raised in that address. In Professor Hall’s own words: ‘We must envy the way in which general historians admired by their own colleagues can also command a wide public readership; here we have so far largely failed.’⁷ Has that failure yet been reversed?

I believe there have been substantial gains; but a worrying question remains: to what extent is there a mismatch between the strategies we use to defend our discipline and those best suited for winning less specialized audiences? In the first part of this address I shall explore this mismatch, without drawing too depressing a conclusion. In the second, I hope to show how the popular narrative can sometimes provide a stimulus for original work. My example is a seductive line in gender studies and its impact on conventional scholarship in the domain of ‘science and religion’.

There are certain kinds of mismatch that are virtually impossible to avoid. This is because of the diversity of our publics and divergent sensibilities among them. What the scientist wants from the history of science will often be very different from the desiderata of the historian. I remember once being asked by a chemist for a complete run down on the state of chemical theory in 1920 so that he could understand some mystifying formulas. That is not the sort of question one is likely to be asked by colleagues in the humanities.

But there is another kind of mismatch. This arises from the dissonance between simple narrative forms that have proven public appeal and the complexities disclosed by serious scholarship. Publics like their legends, their foundation myths, their Eureka moments and their crucial experiments. In a popular biography of Galileo, James Reston concedes there may be doubt about the Leaning Tower experiment, but only after milking it for all its worth. It is a legend that for narrative purposes he wants to be true:

As legend has it, he advertised his demonstration widely, bringing out an excited throng of students and professors. Emerging expansively at the top amid the pilasters and precarious open arcades, he played to his crowd. He was greeted by a roar. The odd catcall punctuated the amused cheers, for most of the crowd undoubtedly hoped to witness a fiasco. There was something about the tower that seemed to attract freaks and exhibitionists. Who was this junior genius?⁸

And who, we might add, is really playing to the crowd? There is much in this recent biography to enjoy, but the author is clearly courting an audience that likes its great moments in history. We are told that in Galileo’s life is to be found the precise moment when modern history was born, the confrontation between the modern and medieval mind, the conflict between science and faith, between Renaissance and Counter-Reformation. And because Reston paints only in black and white, Galileo is axiomatically in the right whenever his science is mentioned. Aristotelian teaching is simply ‘clap-trap’.

In our scholarship we cannot help but become kill-joys. We dismiss legends, dissolve foundation myths, dilute the Eureka moments and destroy the crucial experiments. There

6 A. R. Hall, ‘Can the history of science be history?’, *BJHS* (1969), 4, 207–20.

7 Hall, *op. cit.* (6), 219.

8 J. Reston, Jr, *Galileo: A Life*, New York, 1994, 30.

was a time when this was how one won one's spurs as a serious historian of science. It was, I think, how I won mine some thirty years ago when, with all the vigour of youth, I exposed one of the foundation myths of organic chemistry – that Wöhler's synthesis of urea in 1828 killed off vital forces.⁹ The dilemma is a real one. As our histories of science, with complete propriety, become more refined, so they run the risk of losing their appeal. A Darwin who mixed up his specimens on the Galapagos islands is not as glamorous as a Darwin who, with a flash of insight, changed the world overnight.¹⁰

In recent months we have seen one of the history of science's greatest hits. Dava Sobel's runaway success *Longitude* is the story of John Harrison, the humble clockmaker who, by perfecting machines that could keep accurate time at sea, solved a problem that had defeated the best brains in Europe.¹¹ As it says on the back cover, 'Sobel has done the impossible and made horology sexy.' Her subtitle delineates a story line that has clearly gone down well: 'the true story of a lone genius who solved the greatest scientific problem of his time'. The heroic solution of a recalcitrant problem clearly makes a good yarn. In Sobel's winning account the solution to the longitude problem is given added poignancy through descriptions of the many who had perished at sea, either wracked with scurvy, or simply wrecked. The problem that Harrison solved is also given a tantalizing quality by assimilating it to others that transcended the art of the possible: the quest for the fountain of youth, for perpetual motion, for the transmutation of metals into gold.

It is brilliantly done. But the implication of that subtitle is that there is only one story to be told, that this is it, that Harrison was indeed a genius and that his achievement was dependent on no-one but himself. To be fair, various debts of Harrison to others are mentioned in the text;¹² but it is not difficult to see why expert reviewers have cavilled. 'Heroic individualism', complains one, 'is rarely a reliable guide to the workings of science and technology'.¹³ The mismatch occurs because the academic historian detects what Simon Schaffer describes as an 'unwillingness to distribute ingenuity across time and space'.¹⁴ The dilemma is much as before. The more we redistribute the ingenuity, the more we risk losing contact with those who can respond only to the kind of story Sobel has so neatly crafted.

The master narratives that *have* affected public perception have not surprisingly been those which impose a pattern on historical events that is simply grasped and aesthetically pleasing. The linear triumphalist histories of scientific progress against which Thomas Kuhn famously fought would be an obvious example. Another, from the nineteenth century, would be Auguste Comte's vision of the three stages through which human

9 J. H. Brooke, 'Wöhler's urea and its vital force? – a verdict from the chemists', *Ambix* (1968), 15, 84–114, reprinted in Brooke, *Thinking About Matter: Studies in the History of Chemical Philosophy*, Aldershot, 1995.

10 F. J. Sulloway, 'Darwin and his finches: the evolution of a legend', *Journal of the History of Biology* (1982), 15, 1–53.

11 D. Sobel, *Longitude: The True Story of a Lone Genius who Solved the Greatest Scientific Problem of his Time*, London, 1995.

12 Sobel, *op. cit.* (11), makes brief reference to the work of Huygens, Jeremy Thacker and John Jefferys on 38, 57 and 105–6.

13 S. Schaffer, quoted in Gail Vines, 'Big guns blaze in a rodeo of bestsellers', *Times Higher Education Supplement*, 25 July 1997.

14 Schaffer, *op. cit.* (13).

understanding had passed, from the theological to the metaphysical to the positive and scientific. Simplistic; but the pattern sticks – as it does, too, in those nineteenth-century histories of conflict between science and religion that we associate with John William Draper and Andrew Dickson White.¹⁵ These are narratives structured by a simple leitmotif and reinforced with memorable anecdotes – such as the wretched fate of post-Franklin bellringers whose belfries still depended on divine providence rather than lightning rods. White blamed the clergy for their reluctance to fit the new device and such blame-narratives can be very attractive to sectors of the public who share the political sympathies of the author. In Draper's *History* the blame fell squarely on the Roman Catholic Church for having obstructed the course of scientific inquiry. In a more recent text that attracted a following among 'new age' sympathizers Fritjof Capra laid the blame for the world's ecological ills on seventeenth-century mechanical philosophers, particularly Descartes and Newton. In quantum mechanics and the holistic philosophies of Eastern religions salvation was to be found.¹⁶ We have to recognize that, for many readers of Capra, this is not simply what the history of science shows; it is what the history of science is. Dislocation between the serious and the popular can be very marked in such a case. In one of his Gifford Lectures, Geoffrey Cantor was able to construct a twenty-point critique of Capra's thesis.¹⁷

Stories of struggle against adversity constitute a particularly winning formula, especially if there is some kind of victory. Reston's biography of Galileo works like a dream because it is structured around Galileo's struggle against the political oppression of his Church. Galileo is not exactly a victor but every encounter he has with a representative of authority takes on a melodramatic quality. The primary sources show a repeated insistence on the part of Galileo's interrogator, Vincenzo Maculano, that he tell the truth about his intentions in the *Dialogue*.¹⁸ Reston treats his readers to a slanging match in which Maculano, as persistent as a pit bull terrier, is actually shouting.¹⁹ It is the kind of story that, as Brecht discovered, makes a good play. In Reston's version, there is sex, violence and psychodrama. Galileo is the bawdy youth who strikes out for Venice 'as if it were the Hollywood of his day and he had impossible dreams of stardom'.²⁰ We witness the death of Bruno in all its gory detail and we are led down the dark, dripping backwaters of Venice to watch the attempted assassination of Paolo Sarpi. In the confrontation between Galileo and Urban VIII paranoid meets paranoid.

The motif of struggle against adversity rings through Sobel's narrative on the misfortunes of John Harrison. Here the contest is not between an innovator and the Church but between an innovator and the scientific establishment. The cast is unashamedly one of heroes and villains, with an astronomer royal, Nevil Maskelyne, cast as villain-in-chief. Because Maskelyne had a vested interest in perfecting lunar/astronomical methods

15 J. W. Draper, *History of the Conflict Between Religion and Science*, London, 1875; A. D. White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols., New York, 1896.

16 F. Capra, *The Tao of Physics*, London, 1975, and *The Turning Point*, London, 1983.

17 J. H. Brooke and G. N. Cantor, *Reconstructing Nature: The Engagement of Science and Religion*, Glasgow Gifford Lectures 1995, Edinburgh, 1998, 75–105.

18 M. A. Finocchiaro, *The Galileo Affair: A Documentary History*, Berkeley, 1989, 256–62 and 286–7.

19 Reston, *op. cit.* (8), 259.

20 Reston, *op. cit.* (8), 40.

of longitude determination, the story becomes a winner: we have a race between a ‘country bumpkin’ and the scientific élite.²¹ Because it was a race with a monetary prize the reader is even more caught up in the machinations.²²

Struggle against the scientific élite is the subject of another popular history of science. In Margaret Wertheim’s book, *Pythagoras’ Trousers*, the struggle is between men and women. Her subject is the large scale exclusion of women from science until our own century. Her thesis is that the mathematical and physical sciences in particular have been dominated by a scientific priesthood, which like religious priesthods have kept women at bay. Oppressed by a secular as well as a sacred clerisy women have been hit by a double whammy. In her own words, physics is the Catholic Church of science.²³ It makes a winning story because we have a simple pattern, a narrative of struggle and one of blame all rolled into one.²⁴ Any evidence of affinity between scientific and religious discourse in the past, and especially of their integration, becomes grist to the mill. The modern physicist who claims to know the mind of God personifies the ‘decadent priest’ who has ‘spent most of his history without female company’.²⁵

It would be the height of insensitivity, especially in a male response, to minimize the struggle of mathematical women. ‘From my earliest years’, wrote Mary Somerville, ‘my mind revolted against oppression and tyranny, and I resented the injustice of the world in denying all those privileges of education to my sex which were so lavishly bestowed on men’.²⁶ But if I read the signals correctly, there is something of a mismatch between popular narratives of exclusion and oppression and more sophisticated work in gender studies.²⁷ I am thinking of historical investigations designed to bring out the way in which scientific theory has been used to construct gender differences and to naturalize female inferiority. We have been shown how for Charles Darwin man was the ‘more powerful in body and mind’, how in his account of sexual selection the male became the manipulative analogue of the animal breeder.²⁸ We have also been shown how, during the nineteenth century, psychological divisions between the sexes were rigidified through the sciences. In 1852 the German physiologist Hermann Lotze claimed that ‘analytical reflection is so little natural to women’ that, in their speech, words like to the *right*, to the *left*, and *across* signified no mathematical relationships.²⁹

21 Sobel, op. cit. (11), 72.

22 Sobel, op. cit. (11), 8 and 118.

23 M. Wertheim, *Pythagoras’ Trousers: God, Physics, and the Gender Wars*, New York, 1995, 9.

24 Wertheim, op. cit. (23), 11–12.

25 Wertheim, op. cit. (23), 15.

26 Martha Somerville, *Personal Recollections from Early Life to Old Age of Mary Somerville with Selections from her Correspondence*, London, 1873, 45–6.

27 For a comparison of the questions being asked now with those of ten years ago, see *Women, Gender, and Science: New Directions* (ed. S. G. Kohlstedt and H. E. Longino), *Osiris* (1997), 12; and Londa Schiebinger, ‘The history and philosophy of women in science: a review essay’, in *Sex and Scientific Inquiry* (ed. S. Harding and J. F. O’Barr), Chicago, 1987, 7–34.

28 E. Richards, ‘Darwin and the descent of woman’, in *The Wider Domain of Evolutionary Thought* (ed. D. Oldroyd and I. Langham), Dordrecht, 1983, 57–111, and ‘Redrawing the boundaries: Darwinian science and Victorian women intellectuals’, in *Victorian Science in Context* (ed. B. Lightman), Chicago, 1997, 119–42.

29 L. Jordanova, *Sexual Visions: Images of Gender in Science and Medicine between the Eighteenth and Twentieth Centuries*, London, 1989, 38.

Within gender studies there has also been a concern to switch the spotlight from oppression to the spaces women were able to create for themselves in particular contexts. There is a striking example of this in a recent issue of the Society's journal. Paula Gould's essay on 'women and the culture of physics in late-nineteenth-century Cambridge', is explicitly about collaboration and integration, not sex war. The female researchers she identifies were 'not isolated oddballs, figures of fun for discussion by the male workers'. They were 'family friends, relations, educated women, keen researchers seeking experimental space'.³⁰ Cavendish men did not ridicule their presence but 'gave directions, suggestions and, occasionally, marriage proposals'.³¹ The mismatch was noted some years ago by my successor as the Society's president, Ludmilla Jordanova. The enterprise, she wrote, is 'not undertaken responsibly if it simply sets out to find and document the "oppression" of women by science and medicine'.³² This is because 'it is not just women but gender that is at issue; a dynamic, socially constructed polarity'. Nor is oppression at issue but 'a whole array of cultural processes through which men's and women's bodies and roles are comprehended, managed and given meaning'. The problem, as she explicitly stated, is that these cultural processes cannot be reduced to simple formulas. They are 'formidably intricate' and 'elusive'.³³

I hope I have given enough examples to indicate why the popularization of serious history of science cannot be a straightforward matter of dilution plus a pinch of anecdote. The rhetorical defences we have given for our subject within academe are powerful but can they be adapted to public consumption? A history of science can reveal the diversity in the methods and practices of scientific investigation; it can demonstrate how scientific authority has been constituted in different societies; it can show how scientific knowledge has been used time and again to legitimate social and political preferences. Crucially it can expose the dependence of research priorities and even what passes for acceptable knowledge on human values. But what is our audience for these and similar projects? We have become extremely sophisticated when analysing the rhetoric of scientists themselves as they promote their aims.³⁴ But have we been sufficiently reflexive in contemplating our own?

I leave this as a question because, despite the gravity of the problems, there are also grounds for optimism. Given my title, it would be peculiar if I were not to indicate promising new developments in at least one of the fields in which I have taken an interest: the discussion of what are uncomfortably called the relations between science and religion.³⁵ Here there has been a welcome departure from the procrustean moulds of the

30 P. Gould, 'Women and the culture of university physics in late nineteenth-century Cambridge', *BJHS* (1997), 30, 127–49, on 149.

31 Gould, *op. cit.* (30), 149.

32 Jordanova, *op. cit.* (29), 158.

33 Jordanova, *op. cit.* (29), 159.

34 For an outstanding example in one of my own spheres of interest, the history of chemistry, see J. Golinski, *Science as Public Culture: Chemistry and Enlightenment in Britain, 1760–1820*, Cambridge, 1992.

35 One has to say 'uncomfortably' because of the artificiality involved in abstracting the 'science' and the 'religion' from historical contexts in which it is anachronistic to do so and because of the recurrent danger of reifying these terms when it is more apposite to analyse the changing social processes and practices (and not merely the philosophical categories) associated with each: J. H. Brooke, *Science and Religion: Some Historical*

past in which a wealth of complexity and diversity was compressed into the grooves of either essential conflict or essential harmony. As examples of revisionism in the realm of Victorian studies, one could point to the challenging thesis of Robert Young who insisted that the post-Darwinian debates about man's place in nature took place within a framework of natural theology not against it. His reasoning was that the Darwinians tended to naturalize many of the same values as their priestly forebears.³⁶ Or one could point to the alternative revisionism of Frank Turner who saw a genuine conflict between 'science' and 'religion' in the mid-Victorian era, but one that had to be understood in social terms, as self-consciously professionalizing scientific groups deliberately wrested authority from the clerical amateurs.³⁷ Recently we have been directed from national to local contexts. Thus the greater receptivity of Calvinists to Darwinism in Princeton compared with that in Belfast has been the subject of an arresting study by David Livingstone.³⁸

But a striking point, and this has been made by my Lancaster colleague Maureen McNeil, is that such revisions have taken place with little or no regard for issues of gender.³⁹ It is as if the discourses of 'science and religion' and those of gender studies have gone their own sweet way never to meet. At the joint British/North American conference in the history of science held in Manchester in July 1988, a session on science and secularization clashed with a session on women in science. As discussion in the secularization group shifted to the role of women in policing the boundaries of what it was respectable for Darwin to say, there was the pertinent suggestion that we should have amalgamated the two sessions. The point is that, for all its oversimplification, a book such as *Pythagoras' Trousers* does bring the two limbs into contact. As in the work of David Noble, a world without women is ascribed to the Christian clerical culture of western science.⁴⁰ It is difficult not to be challenged by this interpretation. It has been seen as defining 'an unusual moment of scholarly synthesis between [two] fields of science studies'.⁴¹ My sense is that there will indeed be growing points here for the future. And they will arise not from a haughty dismissal of the meta-narratives but from a critical engagement with them.

To illustrate what I mean, I should like to present a brief case-study. It concerns a woman, Mary Somerville, who did make her mark in the world of science. During her life

Perspectives, Cambridge, 1991; A Cunningham, 'How the *Principia* got its name', *History of Science* (1991), 29, 377–92; J. R. Moore, 'Speaking of "science" and "religion" – then and now', *History of Science* (1992), 30, 311–23; M. J. S. Rudwick, 'The shape and meaning of earth history', in *God and Nature: Historical Essays on the Encounter Between Christianity and Science* (ed. D. C. Lindberg and R. L. Numbers), Berkeley, 1986, 296–321; D. B. Wilson, 'On the importance of eliminating *science* and *religion* from the history of science and religion: the cases of Oliver Lodge, J. H. Jeans and A. S. Eddington', in *Facets of Faith and Science* (ed. J. van der Meer), 4 vols., Lanham, 1996, i, 27–47.

36 R. M. Young, *Darwin's Metaphor: Nature's Place in Victorian Culture*, Cambridge, 1985.

37 F. M. Turner, 'The Victorian conflict between science and religion: a professional dimension', *Isis* (1978), 69, 356–76.

38 D. N. Livingstone, 'Darwinism and Calvinism: the Belfast–Princeton connection', *Isis* (1992), 83, 408–28.

39 M. McNeil, 'Clerical legacies and secular snares: patriarchal science and patriarchal science studies', *The European Legacy* (1996), 1, 1728–39.

40 D. F. Noble, *A World Without Women: The Christian Clerical Culture of Western Science*, Oxford, 1992.

41 McNeil, op. cit. (39), 1728.

she enjoyed such recognition among the scientific élite that her bust, if not she herself, found its way into the sanctuary of the Royal Society. She has been an obvious subject for those who specialize in gender studies. She might also attract attention for having progressive views on the connections between science and theism. Can we learn more from her story when we keep both discourses in view? Might she even be used to check the meta-narrative that correlates female exclusion with priestly oppression?

Here I step gingerly, knowing where angels fear to tread. A moving story can, and should, be told of Mary Somerville's bravery and tenacity as she overcame the towering difficulties that stood in the way of her becoming a queen of the sciences. But her entry into the mathematical and physical sciences also provides a test case of how such a woman was perceived on a cultural island occupied by men. And since clerical scientists were among those who helped her, it may turn out that the stereotype of an oppressive scientific priesthood may not always fit. If Margaret Wertheim and David Noble are right that a masculine clerical regime has dominated the physical sciences, even after their secularization, the encounter between Mary Somerville and the scientific élite of her day takes on a special fascination. According to the stereotype, a Cambridge man who was both physical scientist *and* priest would be the least sympathetic to her aspirations. Re-enter William Whewell; but not quite yet.

In order to construct a balanced view, we should note some of the difficulties that were stacked against her as a woman. A common prejudice against female education she encountered in her own parents.⁴² She was deeply conscious of the gulf that separated her as an autodidact from university educated men. Perhaps the most crucial moment in her career was when she received an invitation from Henry Brougham to give an accessible account of Laplace's *Mécanique Céleste*.⁴³ The letter, she recalled, had surprised her beyond expression: 'I thought Lord Brougham must have been mistaken with regard to my acquirements, and naturally concluded that my self-acquired knowledge was so far inferior to that of the men... educated in our universities that it would be the height of presumption to attempt to write on such a subject, or indeed on any other.'⁴⁴ One can hear the modesty but also the disparity in educational privilege.

The account she gives of her scientific writing, particularly its many interruptions, shows how she was indeed struggling against deeply entrenched social conventions. 'A man', she wrote, 'can always command his time under the plea of business, a woman is not allowed any such excuse'.⁴⁵ Writing in secret lest her Laplacian enterprise should come to nothing, she had to bear the annoyance of well-meaning friends. In the midst of a difficult problem visitors would intrude and announce that they had come to spend a few *hours* with her.⁴⁶

42 E. C. Patterson, 'Mary Somerville', *BJHS* (1969), 4, 311–39, especially 314.

43 On Brougham and his Society for the Diffusion of Useful Knowledge, see J. N. Hays, 'Science and Brougham's Society', *Annals of Science* (1964), 20, 227–41; J. Topham, 'Science and popular education in the 1830s: the role of the *Bridgewater Treatises*', *BJHS* (1992), 25, 397–430. Brougham's sister had been an early companion of Somerville, whose earliest attempts to come to terms with Laplace's text are recorded in Martha Somerville, *op. cit.* (26), 80–2.

44 Martha Somerville, *op. cit.* (26), 162–3.

45 Martha Somerville, *op. cit.* (26), 163–4.

46 Martha Somerville, *op. cit.* (26), 164.

The segregation of the sexes at the end of the dinner meant that she herself spent more than a few hours of boredom.⁴⁷ If her own accomplishments became an argument for the education of women in every field, it was because she had shown how mathematical and scientific learning could be combined with, not substituted for, the attributes of a good wife and mother.⁴⁸ A compliment from Lady Herschel, wife of Sir John, says it all: ‘you have not abjured your sex, while soaring far above it’.⁴⁹

Having said all that, if we chart the manner in which Mary Somerville created space for herself among the scientific élite, there are features of her story that become more engaging because certain clerical values and certain desires of the physical scientists appear to have worked in her favour.

Whereas her parents had discouraged her from study, her uncle had impressed her with his approval. The uncle was minister of the kirk at Jedburgh and father to William Somerville who was to become her second husband. In childhood this clerical uncle had proved useful in helping her with her Latin. But he had also impressed her with a vision of what women could achieve: ‘he assured me that in ancient times many women, – some of them of the highest rank in England – had been very elegant scholars, and that he would read Virgil with me if I would come to his study for an hour or two every morning before breakfast, which I gladly did’.⁵⁰ It has been pointed out that the device of a male observer approving the actions of the girl heroine is something of a cliché in Victorian biographies.⁵¹ But if he was often a sympathetic minister this must surely qualify the image of clerical obstruction. True, it was a long way from Virgil to the orbit of Venus, but not to the value of learning.

How oppressive were the physical scientists among whom she eventually established her credentials? In her earliest battles with the mathematics of Laplace, she would receive advice and encouragement from the Reverend John Playfair.⁵² When she in her turn rendered Laplace accessible, John Herschel, who was to be a lifelong friend, responded with obvious warmth: ‘You will only, I fear, give too strong a stimulus to the study of abstract science by this performance.’⁵³ There was a paean of praise from George Peacock who, as a Cambridge mathematician *en route* to Ely Cathedral, might be thought a perfect embodiment of repressive values. Instead he deemed her exposition of Laplace ‘a work of the greatest value and importance’.⁵⁴ Politeness to be sure; but not a vacuous response. As aware as Henry Brougham that the public understanding of science was an urgent matter, Peacock saw how her grasp of physical astronomy gave her book a distinctive value. Thus he wrote to say that ‘Dr Whewell and myself have already taken steps to introduce it into

47 Martha Somerville, *op. cit.* (26), 142.

48 Patterson, *op. cit.* (42), 319.

49 E. C. Patterson, *Mary Somerville and the Cultivation of Science, 1815–1840*, Boston, 1983, 90.

50 Martha Somerville, *op. cit.* (26), 37.

51 M. Vicinus, ‘“Tactful organising and executive power”: biographies of Florence Nightingale for girls’, in *Telling Lives in Science: Essays on Scientific Biography* (ed. M. Shortland and R. Yeo), Cambridge, 1996, 195–213, especially 202.

52 Patterson, *op. cit.* (49), 4–5.

53 Martha Somerville, *op. cit.* (26), 167.

54 Martha Somerville, *op. cit.* (26), 172.

the course of our studies at Cambridge.⁵⁵ This was no empty promise because most of her sales were in that bastion of male privilege.⁵⁶

Whewell's response is particularly absorbing. Few embodied so magisterially the conjunction of Cambridge privilege, mathematical prowess and clerical garb.⁵⁷ Yet it is the entrenched prejudice against women's powers that he vigorously opposes. Privately he congratulates Somerville on her *Mechanism of the Heavens*. He is 'glad that our young mathematicians in Trinity will have easy access to the book'. Disarmingly he says that 'when Mrs. Somerville shows herself in the field which we mathematicians have been labouring all our lives, and puts us to shame, she ought not to be surprised if we move off to other ground'.⁵⁸ Once a university prize-winner in poetry, Whewell returned to that ground and promptly composed a sonnet in her honour. The original copy in the Bodleian archive is decorated with graceful leaves and branches and gives us a rare glimpse of Whewell as an artist.⁵⁹

Publicly, as well as privately, Whewell chided the plumed males who regarded the sciences as their exclusive preserve. In the new 1832 edition of his *Treatise on Dynamics* he pointed to Somerville's work as proof that mathematical studies were not irreconcilable with 'all the gentler train of feminine graces'.⁶⁰ Later, when he reviewed her *Connexion of the Physical Sciences* for the *Quarterly Review*, it was she herself he reproached for extending a gender divide. She had dedicated her book 'To the Queen' and addressed it to her fellow countrywomen.⁶¹ Surely, Whewell protested, men were not to be excluded from edification. 'We believe', he effused, 'that there are few individuals of that gender which plumes itself upon the exclusive possession of exact science, who may not learn much that is both novel and curious from this little volume'.⁶² One might detect a certain depreciation in his use of the diminutive (her book was 'little' only in comparison with his pending historical and philosophical tomes!). But his commendation was surely genuine. What a boon it was when a person of 'real science' like Mrs Somerville condescended to write for the wider public.⁶³ He had praise, too, for the originality and nobility with which she had conferred a unity on the sciences when the trend had long been towards disintegration.⁶⁴ Until I read Whewell on Somerville, I had not realized that he could sound like the C. P. Snow of his day. He complained that 'the students of books and of things are

55 Martha Somerville, op. cit. (26), 172.

56 Martha Somerville, op. cit. (26), 173.

57 For an introduction to Whewell, see *William Whewell: A Composite Portrait* (ed. M. Fisch and S. Schaffer), Oxford, 1991; and R. Yeo, *Defining Science: William Whewell, Natural Knowledge and Public Debate in Early Victorian Britain*, Cambridge, 1993.

58 Martha Somerville, op. cit. (26), 171.

59 Whewell to William Somerville, 2 December 1831, Mary Somerville papers, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2. In referring to the Somerville archive it gives me special pleasure to acknowledge the invaluable contribution of Elizabeth Patterson in imposing order on so large a collection. The sonnet is reproduced in Martha Somerville, op. cit. (26), 171.

60 Yeo, op. cit. (57), 111.

61 Queen Adelaide in the first edition; but, through no change in the inscription, Queen Victoria from the fourth onwards.

62 Whewell, op. cit. (2), 56. Ironically it had been the males, and Brougham in particular, who had suggested that the dedicatee be the Queen; Patterson, op. cit. (49), 120 and 131.

63 Whewell, op. cit. (2), 58.

64 Whewell, op. cit. (2), 58–9.

estranged from each other in habit and feeling'.⁶⁵ In a solemn note he observed that 'the disintegration goes on, like that of a great empire falling to pieces'.⁶⁶ In 1834 he could praise Mary Somerville for holding the ship together.

Alert scholars might detect in Whewell's review a greater degree of condescension than is first apparent. There is certainly a self-consciousness about the woman question that he cannot ultimately escape: 'our readers cannot have accompanied us so far without repeatedly feeling some admiration ... that the work is that of a woman'.⁶⁷ In describing her book as *masterly* he presumed on her excusing the word.⁶⁸ But there was no ambiguity in the message he chose to put across: 'there is this remarkable circumstance in the case, that where we find a real and thorough acquaintance with these branches of human knowledge, acquired with comparative ease, and possessed with unobtrusive simplicity, all our prejudices against such female acquirements vanish'.⁶⁹ It is striking that when David Noble, in his meta-narrative of female exclusion, came to discuss Somerville and Whewell, no space was found for this masculine liberalism.⁷⁰

I am not trying to turn Whewell into a saint. There were limits to his equalization of the sexes. In fact he insisted that despite the fanciful dreams of theorists 'there is a sex in minds'.⁷¹ He asserted that one of the characteristics of the female intellect is a clearness of perception; but he also said that action in women is the result of feeling, thought the result of seeing: 'their practical emotions do not wait for instruction from speculation; their reasoning is undisturbed by the prospect of its practical consequences'. In men on the other hand, 'practical instincts and theoretical views are perpetually disturbing and perplexing each other ... The heart and the head are in perpetual negotiation, trying in vain to bring about a treaty of alliance, offensive and defensive'.⁷² This is not Whewell at his best and, as Richard Yeo has pointed out, it means there is ambiguity in his position after all.⁷³ Yet the bottom line was not unflattering: 'from the peculiar mental character to which we have referred, it follows that when women are philosophers, they are likely to be lucid ones'.⁷⁴ Does this mean that women could only ever be expositors of science, never discoverers? This was how Somerville sometimes presented herself: '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'.⁷⁵ The irony is that Whewell felt himself similarly deficient.⁷⁶

⁶⁵ Whewell, *op. cit.* (2), 59.

⁶⁶ Whewell, *op. cit.* (2), 59. Whewell's differentiation of the sciences by reference to their distinctive 'fundamental ideas' means that there was a sense in which he contributed to that very disintegration, but at the same time seeking to protect an overarching unity. For an analysis of the tensions here, see Yeo, *op. cit.* (57), 231–55.

⁶⁷ Whewell, *op. cit.* (2), 64.

⁶⁸ Whewell, *op. cit.* (2), 55.

⁶⁹ Whewell, *op. cit.* (2), 65.

⁷⁰ Noble, *op. cit.* (40), 279.

⁷¹ Whewell, *op. cit.* (2), 65.

⁷² Whewell, *op. cit.* (2), 65.

⁷³ Yeo, *op. cit.* (57), 111.

⁷⁴ Whewell, *op. cit.* (2), 65.

⁷⁵ Patterson, *op. cit.* (42), 323.

⁷⁶ Yeo, *op. cit.* (57), 112.

Was Somerville merely an expositor or did she engage in practical experimental work? Here it would be all too easy to assimilate her to Whewell's categories. A woman's place, the message seemed to be, is not among instruments and apparatus. A superficial reading of her *Memoirs* might favour such gender division. When speaking of the mineral collection that she and her second husband treasured, she reported that she never followed him in the use of the blowpipe⁷⁷ – perhaps because he once nearly poisoned her when he laced the air with arsenic! But then other nuances force themselves upon us, because she did learn to use Wollaston's goniometer, she did use the telescope, she did play with Thomas Young's prism to catch the dark lines of the solar spectrum. She enjoyed practical astronomy and published in the Royal Society's *Philosophical Transactions* the results of experiments designed to discover whether light rays possess magnetizing powers. It seems that the question should not be whether scientific practice was excluded but the more nuanced question: which forms of practice might have been judged the safer and more seemly for a woman to adopt?

Whewell's encouragement to Mary Somerville went beyond the penning of polite words. In spring 1834 he was prominent among those who issued an invitation for her and her husband to visit Cambridge, where, remarkably for the time, she was allowed to reside inside Trinity. She herself considered it an unusual favour.⁷⁸ Whewell, George Airy and Adam Sedgwick were all duly solicitous, Sedgwick writing to say that 'a four-poster bed (a thing utterly out of our regular monastic system) will rear its head... in the chambers below my own'.⁷⁹ One hardly need add that that letter was addressed not to Mary but to her husband. The way she was treated by the heads of the university gave her special pride.⁸⁰ If we can accept what she recorded in her *Memoirs*, it was not her perception that she had encountered resistance from a scientific brotherhood: 'I have uniformly met with the greatest kindness from scientific men at home and abroad.'⁸¹ That kindness took many forms. Both Faraday and Whewell, Christian scientists of different hue,⁸² were responsive consultants for her *Connexion of the Physical Sciences*, Faraday noting with pleasure both her grasp and approbation of his 'late Experimental Researches',⁸³ Whewell discharging his obligation with a thoroughness that greatly impressed Somerville's biographer, Elizabeth Patterson.⁸⁴ He displayed kindness in other respects too. In April 1833 he had issued a pressing and respectful invitation that she might attend the forthcoming

77 Martha Somerville, op. cit. (26), 128.

78 Martha Somerville, op. cit. (26), 179.

79 Martha Somerville, op. cit. (26), 180.

80 Martha Somerville, op. cit. (26), 179.

81 Martha Somerville, op. cit. (26), 158. This does not mean that she experienced no exclusion. In an obituary notice, Richard Proctor reported that, when in Italy, she had been denied sight of the comet of 1843 because the only Italian observatory that had the necessary instruments was in a Jesuit establishment where women did not cross the threshold. See Patterson, op. cit. (42), 328 n112.

82 On Faraday's dissenting, Sandemanian, Christianity see G. Cantor, *Michael Faraday: Sandemanian and Scientist*, London, 1991.

83 Faraday to Mary Somerville, 1 March 1834, in *The Correspondence of Michael Faraday* (ed. F. A. J. L. James), 3 vols., London, 1991–6, ii, 166. See also pp. 152–3 and 198 for Faraday's advice on the proofs, which she duly took; Patterson, op. cit. (49), 133–5.

84 Patterson, op. cit. (49), 130.

Cambridge meeting of the British Association for the Advancement of Science;⁸⁵ and he continued to share with her the latest ‘steps made in science’. Typically, he told her that ‘some of them are curious: none more so than the periodicity of the solar spots, and the correspondence of their period with that of the diurnal variation of magnetism’. What, he exclaimed, ‘can the sun’s spots have to do with magnetism!’⁸⁶

There are already facets of this story that seem not quite to fit the picture of a repressive priestly caste, whether sacred or secular. There could, of course, be pre-emptive objections to such a simple empirical conclusion. Is not Mary Somerville the exception that proves the rule? Whewell would assume her uniqueness when venturing critical comments: ‘Mrs. Somerville can easily afford her critics an indulgence which other ladies would not dream of.’⁸⁷ Was she not exceptionally fortunate in her choice of husbands, the first, Samuel Greig (who by her own account had no interest in science), conveniently dying, giving her the time and means to pursue her studies; the second, William Somerville (a young FRS), giving her contacts, encouragement and books from the Royal Society library? It might be said that she was accepted so far by the scientific community only because she was willing to conform to its own value system. Marina Benjamin has referred to a masking of her gender identity, captured in John Herschel’s remark that in her *Mechanism of the Heavens* ‘she seems entirely to have lost sight of herself’.⁸⁸ It might be said that she was accepted only because on a pre-professional stage it was possible for a woman to enter without rousing male jealousies and fears.⁸⁹ From a radical feminist angle, it might be observed that once inside the charmed circle of masculine science, she would have found it more, not less, difficult to speak of science as male.⁹⁰ Such objections, however, can easily lead to an undervaluation of her scientific credentials and political achievement. As Marina Benjamin herself points out, Somerville was not the malleable, diffident figure portrayed in her daughter’s compilation.⁹¹ There are letters in the Bodleian archive that show her in active competition with her male accomplices. There is, for example, a letter to her son, Woronzow Greig, written on completion of her *Connexion of the Physical Sciences*. This was hard on the heels of Whewell’s *Bridgewater Treatise*. ‘I am glad’, she confided, ‘my book is in the press at last and am still happier to find Whewell’s differs too much from mine to knock out my brains’.⁹² While it is true that Whewell had little to fear from her (in his review of her *Connexion* has been seen a nonchalance born of cloistered security),⁹³ there are revealing moments in their correspondence where the fear of trespass may be felt. When, in June 1832, he had sent her a copy of his *Dynamics*, he had, perhaps defensively, alerted her to his Preface because there the book was described as an ‘Introduction’.⁹⁴ It

85 Whewell to Mary Somerville, 3 April 1833, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

86 Whewell to Mary Somerville, undated, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

87 Whewell to William Somerville, 22 November 1833, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

88 M. Benjamin, ‘Elbow room: women writers on science, 1790–1840’, in *Science and Sensibility: Gender and Scientific Enquiry, 1780–1945* (ed. M. Benjamin), Oxford, 1991, 27–59, on 52.

89 Noble, op. cit. (40), 279.

90 Cf. H. Rose, ‘Hand, brain and heart: a feminist epistemology for the natural sciences’, in Harding and O’Barr, op. cit. (27), 265–82, 266.

91 Benjamin, op. cit. (88), 51.

92 Mary Somerville to Woronzow Greig, 24 April 1833, Bodleian Library, Oxford, Dep. c. 361 folder MSIF-1.

93 Patterson, op. cit. (49), 139.

94 Whewell to Mary Somerville, 5 June 1832, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

would also be quite wrong to say that she capitulated to all the values of her male advisers, even supposing them to be uniform. On one issue at least she could be angry with Whewell, privately condemning him ‘for joining in the hue and cry against mathematicians for irreligion; a vulgar and monkish prejudice’.⁹⁵ This was an allusion to Whewell’s *Bridgewater Treatise*, in which French mathematicians, notably Laplace, had been berated for methods that bred impiety. Somerville had no doubt that this would make his book ‘very popular among the Saints’, but in her own estimation the fault of impiety was ‘owing to the period, and not to the pursuit’.⁹⁶ The mathematical accomplishments of the French had been achieved before and during the Revolution, when unbelief had been *à la mode*.

In Whewell’s *Bridgewater Treatise* there was far more natural theology than in Somerville’s *Connexion*. That is not in the least surprising, given his brief.⁹⁷ But the contrast does raise further questions on the interface of science and religion that a sensitivity to gender issues might reinforce. What were Somerville’s perceptions in the 1830s and 1840s of the antagonism of the clergy towards threatening forms of science? Was a woman perhaps more likely to favour reconciliation than conflict? Looking back later in life, she certainly remembered the antagonism – how the geologists had shocked both clergy and the ‘more scrupulous of the laity’ with their draughts of time.⁹⁸ She had good reason to remember because her two-volume *Physical Geography* (1848) had led to a personal denunciation in York Minster.⁹⁹ The contests that left the most indelible impression had been those in the ethnography – whether there was one human race or many – which had such deep theological reverberations.¹⁰⁰ At the same time, if one wished to show how religious sensibilities could survive the rise of scientific naturalism, Somerville would make an intriguing case-study. The impression one gains from her memoirs is of a peace that transcended popular wrangling. Neither she nor her husband liked to discuss religious matters in public. It was partly to this that she ascribed their retention of a large circle of friends. But it was the view of her daughter Martha that in accepting ‘modern scientific theories’ Mary had seen nothing in them ‘hostile to true religious belief’.¹⁰¹

Whatever true religious belief might mean, it included for Mary Somerville an idealistic form of natural theology closer to Whewell than to Paley. Eschewing the overt piety she disliked in Whewell, she nevertheless wrote without embarrassment on how the sciences supported belief in a Creator. In working on the history of natural theology I have occasionally met the suggestion that it was a type of discourse that appealed or was even intended to appeal particularly to women. I am thinking of evidence from early nineteenth-century France that it appeared in texts addressed to women when it had become less

95 Mary Somerville to Woronzow Greig, 14 June 1833, Bodleian Library, Oxford, Dep. c. 361 folder MSIF-1; Patterson, op. cit. (49), 116.

96 Mary Somerville to Woronzow Greig, 14 June 1833, Bodleian Library, Oxford, Dep. c. 361 folder MSIF-1.

97 On the *Bridgewater Treatises* and their readership, see J. Topham, ‘Beyond the “common context”: the production and reading of the *Bridgewater Treatises*’, *Isis* (1998), 89, 233–62.

98 Martha Somerville, op. cit. (26), 129.

99 Martha Somerville, op. cit. (26), 375.

100 For the background here, see D. N. Livingstone, ‘The preadamite theory and the marriage of science and religion’, *Transactions of the American Philosophical Society* (1992), 82, 3, 1–81.

101 Martha Somerville, op. cit. (26), 375.

visible in more demanding scientific texts.¹⁰² If this were a general pattern, it might be tempting to contrast the masculine, secular science of Laplace and the feminine science of his popularizer in Britain Mary Somerville. Certainly her work on the connection of the physical sciences was framed by references to a supreme and eternal Mind. She described her mathematical formulas as emblematic of Omniscience. However, a simple gendering of natural theology will not work in her case. Her principal theological argument was close to that of Whewell and appears neither elaborated nor doctored for a female audience. One of Whewell's strategies to sacralize Laplace's science involved the proposal that a solar system that could restabilize itself afforded better testimony to divine prescience than one needing divine intervention. With reference to the material world, Whewell insisted that events are brought about not by such intervention but by the establishment of general laws.¹⁰³ This is precisely the emphasis we find in Somerville too. Martha said of her mother that 'she rejected the notion of occasional interference by the Creator with His work, and believed that from the first and invariably He has acted according to a system of harmonious laws'.¹⁰⁴

Is this simply evidence of a female writer succumbing to, and then reflecting, male-imposed stereotypes? I think this would again be to demean Somerville's intellect. In her Memoirs she claimed to have 'very decided religious opinions' and they were clearly linked to her knowledge of the sciences. 'Nothing', she wrote, 'has afforded me so convincing a proof of the unity of the Deity as these purely mental conceptions of numerical and mathematical science which have been by slow degrees vouchsafed to man... all of which must have existed in that sublimely Omniscient Mind from eternity'.¹⁰⁵ In the less sublimely omniscient mind of Whewell, it was the power of the human mind progressively to gain true knowledge of nature that constituted one of the strongest arguments for belief in a deity.¹⁰⁶ Somerville's argument sounds very similar, but there is no reason to consider it a derivative. Common to both, however, was a form of words that, with hindsight, we can see as endorsing a conventionally gendered language when speaking of the divine being itself. Put crudely, scientific progress showed that man was made in the image of God. The closing sentence of Somerville's *Connexion* provides the perfect illustration: 'This mighty instrument of human power itself originates in the primitive constitution of the human mind, and rests upon a few fundamental axioms, which have externally existed in Him who implanted them in the breast of man when he created him after His own image.'

What of Somerville's response to Darwinism? She was close on eighty when the *Origin* appeared and a mere ninety-one when she received her complimentary copy of the *Descent*

102 N. Pigeard, 'La chimie des dames', paper presented to the European Science Foundation conference on the history of chemical textbooks, Uppsala, February 1994, to be published in the conference proceedings edited by B. Bensaude-Vincent and A. Lundgren.

103 On the possibility of both sacred and profane readings of natural 'laws', see J. H. Brooke, 'Natural law in the natural sciences: the origins of modern atheism?', *Science and Christian Belief* (1992), 4, 83–103.

104 Martha Somerville, op. cit. (26), 375.

105 Martha Somerville, op. cit. (26), 140–1.

106 J. H. Brooke, 'Indications of a Creator: Whewell as apologist and priest', in Fisch and Schaffer, op. cit. (57), 149–73; R. Yeo, 'William Whewell, natural theology and the philosophy of science in mid-nineteenth century Britain', *Annals of Science* (1979), 36, 493–512.

of *Man*. Given her particular circle of friends, including John Herschel and Frances Cobbe, it is perhaps not surprising that she outlawed so controversial a theory from new editions of her *Physical Geography*. It is well known that Herschel had disliked the ‘higgledy-piggledy’ aspects of Darwin’s universe and Cobbe had protested, too, railing against the ‘priest-like arrogance’ to be found among some representatives of the ‘modern scientific spirit’.¹⁰⁷ Yet at ninety-one, Somerville could still give her own gloss on Darwin’s *Descent of Man*. The message she extracted was that the beauty of nature ‘is altogether irrelative to man’s admiration or appreciation’.¹⁰⁸ An old anthropocentric natural theology had certainly been knocked. Referring to the ‘admirable sculpture’ visible in organic forms, she observed that it had been invisible before the invention of the microscope. The beautiful colouring of humming birds had been invisible in impenetrable forest depths. On Darwin’s principle of sexual selection the beauty of male birds was reduced to utility. This did not, however, deprive them of their beauty. A greater deprivation came not from male theories but from members of her own sex. ‘Many women without remorse’, she lamented, ‘allow the life of a pretty bird to be extinguished in order that they may deck themselves with its corpse.’¹⁰⁹ This is not the only place where she speaks as a conservationist deploring a ‘cruel fashion’.¹¹⁰ Interestingly, what *might* be seen as a female sensibility towards the preservation of beauty in the world could increase her sensitivity to a feminine foible.

Her remarks on beauty bring us back to our theme for the day: the two cultures. The interpenetration of art and science was of foundational importance in her life. It was through learning to paint that she was launched into geometry. Her biographer, Elizabeth Patterson, found a scrap of paper on which Mary, with a shaky hand, had recorded the decisive moments of her life.¹¹¹ Happily for my theme, it had been inserted in her autographed copy of Whewell’s *History of the Inductive Sciences*. There we find reference to Alexander Nasmyth, the Edinburgh landscape painter with whom she had studied. It was he who had suggested she should read Euclid. So had begun the private study that had caused her father to worry lest she finish up like someone he had heard of who had gone ‘raving mad about the longitude’.¹¹² Not only had she entered the world of mathematics through painting: analogies between the work of a painter and an expositor of science recur in her correspondence. John Herschel thought an early draft of her Laplacian mathematics too sketchy: ‘as a painter’, he added, ‘you will understand my meaning, and what is of more consequence, see how it is to be remedied’.¹¹³ Whewell developed the analogy on a far deeper level. It was in his review of Somerville’s *Connexion* that he declared that ‘the office of language is to produce a picture in the mind’.¹¹⁴ Deeply concerned about the communication of science to a wider audience, he saw in Somerville’s writing an approach constructively different from that of the popular science lecturer. As

107 Richards, ‘Redrawing’, op. cit. (28), 134–5.

108 Martha Somerville, op. cit. (26), 358.

109 Martha Somerville, op. cit. (26), 358.

110 Martha Somerville, op. cit. (26), 18–19.

111 Patterson, op. cit. (42), 338.

112 Patterson, op. cit. (42), 314.

113 Martha Somerville, op. cit. (26), 168–9.

114 Whewell, op. cit. (2), 55.

Simon Schaffer has pointed out, her approach was one that resonated with Whewell's own ambition for a broader linguistic vision of science.¹¹⁵ The public understanding of science required more than the showmanship of the experimental demonstrator. The unity she had achieved in connecting the physical sciences Whewell explicitly compared with that of a Turner-esque painting.

By juxtaposing Somerville and Whewell I have tried to show that the confluence of gender studies with a revisionist historiography of 'science and religion' can yield new questions and nuanced answers. Somerville was undoubtedly dependent on her scientific advisers. Keeping her abreast of the latest schemes of the British Association, even Whewell found himself raving about longitude. Referring in a letter of August 1839 to a 'grand scheme of magnetic observations combined with an Antarctic expedition' that was about to be recommended to government, he advised her of the 'strongest probability that we shall be able, not only to determine the magnetic poles at present as a basis for future observations of their changes, but also find a very easy method of determining the longitude, by means of the simultaneous small changes of the variations'.¹¹⁶ But if Somerville was dependent on her advisers, so in a sense were they on her. Whewell successfully used the family connections bequeathed by her first husband to enlist the Russian government in extending his empire of tidal measurement.¹¹⁷ Nor was this the only occasion on which he sought her assistance. Earlier, in the spring of 1833, when she was residing in France, Whewell unashamedly used her to promote his own interests in Paris. Peddling his newly published *Bridgewater Treatise*, he wished her to commend it to her scientific *confrères*: 'I do not know whether the connexion of science with natural theology is likely at all to interest any of your French acquaintances. My book appears to have a share of popularity here; if any one at Paris wished to translate it I should be glad to supply him with a copy.'¹¹⁸ Mary got the message. In the same letter to her son in which she had expressed relief that there was room in the world for both Whewell's *Bridgewater* and her *Connexion*, she reported that wish for a French translation.¹¹⁹ There is real piquancy here for at least two reasons. Within a Laplacian coterie, on which Whewell had cast aspersions, his connection of science with natural theology was unlikely to be a source of enchantment. Secondly, she had clearly thought of a French translation in connection with her own rather different *Connexion*. There is, however, no trace of resentment in her letter. She says that she will make enquiries on Whewell's behalf and refers to the 'most kind' invitation he had issued for the Cambridge meeting of the British Association.

There was another feature of the symbiosis. Crucially, the sciences needed their expositors then as now. In Whewell's relations with Mary Somerville, a sense of that mutual dependence became explicit. Thus he wrote to his sister in March 1832 that he wanted to make the mathematics text he was preparing for the 'Cambridge folks' correspond with Mrs Somerville's, 'so that they may each help to make the other

115 S. Schaffer, 'The history and geography of the intellectual world: Whewell's politics of language', in Fisch and Schaffer, op. cit. (57), 201–31, especially 225.

116 Whewell to Mary Somerville, 29 August 1839, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

117 Martha Somerville, op. cit. (26), 74; Patterson, op. cit. (49), 186.

118 Whewell to Mary Somerville, 3 April 1833, Bodleian Library, Oxford, Dep. c. 372 folder MSW-2.

119 Mary Somerville, op. cit. (92).

intelligible and useful'.¹²⁰ Contrary to the meta-narratives of exclusion the story can be one of complementarity not contempt.

It has not been my intention in this address to suggest that histories of science have no future unless they become transformed into histories of 'science and X' where X may be art, religion, gender, literature, technology and so on. But I have been suggesting that the insights gained from such studies, when freshly combined, can pose new challenges and stimulate new research. And there is a bonus. The size of our potential audience is greatly increased by those whose primary interest may be in X rather than in science or its history.

I began with a note of ambivalence about the future and I shall end likewise. Fortunately, there are real grounds for optimism. We are beginning to see a recognition among popular science writers that there is a body of scholarship in the history of science on which they can draw. A recent example would be the deference shown by Stephen J. Gould to the work of Martin Rudwick on visual representation in geology.¹²¹ The three authors to whom I earlier referred – Reston, Sobel and Wertheim – are professional journalists who, by their own accounts, did at least take the trouble to consult expert scholars. There are striking examples of success in communicating sophisticated points to a wider audience. A personal favourite is a succinct essay in *New Scientist* where Hugh Torrens corrected the date when the dinosaur got its name. This provided the perfect occasion to get across Adrian Desmond's point that when Richard Owen redesigned the dinosaur it was at the same time a highly political act.¹²² A collection of popular essays entitled *Hidden Histories of Science* was inspired by the response of Oliver Sacks to the biography of Davy written by my predecessor as president, David Knight.¹²³ The hidden histories are of ideas that, like the prodigal son, were lost and found again. Scintillating biographies such as those of Darwin by Janet Browne and by Jim Moore and Adrian Desmond have won public applause.¹²⁴ With its course on the *Rise of Scientific Europe*, the Open University has challenged its mature students to consider why the sciences developed differently and at different rates in different European countries. Our colleagues in the museums of Oxford, Cambridge, and the Science Museum in London have striven successfully to bring scientific artefacts within the compass of history of science teaching. New opportunities through broadcasting hold the promise of further gains. It was particularly pleasing when BBC 2 recently hosted its 'Darwin week-end' to find genuine Darwin scholars on display, exuding a welcome authority. Compared with thirty years ago, we surely can claim that we have taken some publics some way with us. I have also been suggesting that this is not only a one-way traffic. In some domains the challenge offered by a popular narrative can give the history of science a future.

But it is not all gain. Watching the first episode of the Stephen Hawking television series in the late summer of 1997, it was difficult not to experience a strange medley of feelings. At the most basic level it was pleasing that fifty minutes of prime time should have been

120 Patterson, op. cit. (42), 320 n56.

121 S. J. Gould, 'Ladders and cones: constraining evolution by canonical icons', in *Hidden Histories of Science* (ed. R. B. Silvers), London, 1995, 37–67, especially 49–52.

122 H. Torrens, 'When did the dinosaur get its name?', *New Scientist* (4 April 1992), 40–4; A. Desmond, *The Politics of Evolution*, Chicago, 1989, 325–34.

123 Silvers, op. cit. (121), p. i; D. Knight, *Humphry Davy: Science and Power*, Oxford, 1992.

124 J. Browne, *Charles Darwin: Voyaging*, London, 1995; A. Desmond and J. Moore, *Darwin*, London, 1991.

given over to the great turning points in our understanding of the universe. It was gratifying that at least some professional historians of science were introduced to lend their authority. Yet in other respects it was a dispiriting experience. The history was never more than a prelude to the present. As so often, the message was apocalyptic: only now, at last, is the universe about to be understood. The history of astronomy was reduced to a history of naïve empiricism in which, as the narrator kept saying, seeing is believing. No doubt a fitting message for a televisual culture; but where oh where were those most rudimentary lessons from the history of science – that one has to learn *how* to see and that one's observations are invariably theory-laden? These were points, incidentally, made by Whewell more than a hundred and fifty years ago. When Galileo observed those famous specks of light around Jupiter and first saw their shifts, he assumed he had seen an uncharted retrograde motion of Jupiter itself, relative to these fixed 'stars'. Only later did the specks become moons.¹²⁵ Only later was the deeper understanding gained. In conveying to the public a deeper understanding of science we still have our work cut out. There are many retrograde motions still to be corrected.

¹²⁵ That there was more to seeing than seeing is evident from the text of Galileo's *Sidereus nuncius*; see also M. Sharratt, *Galileo: Decisive Innovator*, Oxford, 1994, 17. Galileo's initial (mis)reading of what he had seen in terms of Jupiter's retrograde motion has been vividly described by William Shea in a paper presented to the 20th International Congress of the History of the Sciences, Liège, 1997.