WOMEN, SCIENCE AND MEDICINE 1500–1700

EDITED BY
LYNETTE HUNTER &

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MOTHERS AND SISTERS OF THE ROYAL SOCIETY

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LIST OF ILLUSTRATIONS

2 I am grateful to the Bedford-educated Patricia Clarke FRS for this point.

3 Later, Evelyn Fox Keller's biography of Barbara McClintock in some senses replaced Sayre's biography as the definitive narrative. I have difficulties with the popular reading of Keller, with McClintock as the unrecognized intuitive loner, for McClintock was a highly established and recognized scientist, who was not an isolate but lived with a close woman friend. That both McClintock and her immediate colleagues distanced themselves from the Keller biography, whereas Sayre's biography was supported by much of her research community, gives us further food for thinking about biographies and audiences.

4 The popular television film *The DNA Story* cast Jeff Goldblum, which with his stereotypically Jewish looks, massively muddied the historical waters. Watson, Crick and Wilkins, whatever their actual religious beliefs, came from the dominant Christian culture. In the 1950s when there were quotas for Jews to be admitted to public schools and when Jews were routinely excluded from golf clubs etc., this miscasting hides the problem of anti-Semitism.

WOMEN, SCIENCE AND MEDICINE: INTRODUCTION

Lynette Hunter and Sarah Hutton

The years between the founding of Gresham College in 1597 and the founding of the Royal Society in 1661 were critical years in the emergence of modern science. The developments that took place in science in this period are often referred to as the Scientific Revolution, though, latterly, the concept of a revolution in the history of science has come to seem less appropriate as historians of science have begun to note the Renaissance antecedents of many aspects of seventeenth-century science.[1] Whether or not one accepts the revolution model of the emergence of modern science, the seventeenth century was, indeed, a time of new ideas, new theories, new methods of enquiry. The old Aristotelian synthesis of knowledge and the scholastic system of learning had been definitively discredited by the new astronomy of Copernicus and Kepler, and the new mechanics of Galileo. The field was open for new theories to replace the old, and there were plenty of contenders to fill the void.

While Bacon was hailed as their inspiration and precursor by many proponents of new methods of investigating nature,[2] the contribution of other innovators should not be overlooked. Among these, Descartes made a serious claim to being the true heir of Galileo, by applying the principles of the new mechanics to the domain of philosophy. In the 1640s and 1650s Cartesian physics was the main contender to fill the gap left by the demise of Aristotelianism. Descartes proposed a philosophical system which appeared to account convincingly for the phenomena of the universe. His was, however, a system which was arrived at deductively by *a priori* reasoning from first principles rather than inductively, that is *a posteriori*, via experimentation. In so far as Descartes sought to account for all natural phenomena in terms of the size, shape and location of particles in motion, he subscribed to a form of kinematic physics known generically as the mechanical philosophy. Another version of science based on such principles is, of course, to be found in the work of Thomas Hobbes. The important theoretical contribution of figures we nowadays think of as philosophers rather than scientists is itself a reminder that the term 'science' was not yet fixed in its modern sense, but retained its Latin meaning of 'knowledge' in general, even as the term came to denote the more specialized field of knowledge and method of enquiry that it has today. When discussing early modern science it is often more helpful to employ the term still in use in the

seventeenth century for the body of learning pertaining to astronomy, chemistry, physics and biology, namely 'natural philosophy'.

It is also important to remember that even after the establishment of the Royal Society, the method of enquiry into the nature of things that we nowadays call scientific was still in the early stages of development. At the time of the founding of the Royal Society, observational techniques and experimentation which had developed from the medieval technical practices of many trades working with physical, chemical and biological material were certainly established as viable, indeed necessary, for investigating the operations of nature. But the principles of experimental methodology were still in the course of elaboration. Some areas, notably pneumatics, lent themselves more easily to experimental observation than others. Some experiments worked in theory but were impossible to conduct in practice – a famous example is Blaise Pascal's hydrostatic experiment which required a man to sit submerged in 20 feet of water balancing a tube of mercury on his knee.[3]

Furthermore, as the heterogeneity of the contributions to early modern science suggests, science was not yet established as an agreed practice, a particular procedure for investigation and discovery. The picture of natural philosophy in the mid-seventeenth century was more complex, more confusing, more contested, than the scientific method that emerged from it might suggest. This alone explains why, in looking for women's contribution to science in the early modern period, we should not expect to find so many prototypes of modern scientists, so many disregarded Madame Curies patiently compiling their data by observation and experiment in accordance with clearly laid-down principles of verification. From well before the early modern period women had participated substantially in what was then called 'oeconomics', which referred to the primary economic unit of the family within the local community.[4] Their largest field of work was maintaining the household and its contribution to the community. This involved the practice of what we would now think of as physical and organic chemistry, as well as all aspects of preventive medicine and of pharmacy.[5] The technology with which they worked became a fundamental part of the emerging experimental methodology, and was being practised concurrently with refinement of that methodology in the name of natural philosophy. At the same time, the intellectual ferment and the challenge of new ideas and new patterns of thinking in the seventeenth century may well have been a factor in enabling women to participate in the intellectual debates of the period. The evidence is that among educated women many wholeheartedly embraced the new learning of the time.

The emergent state of science in the seventeenth century is not the only explanation for the difficulties encountered in investigating the contribution of women. In conventional history of science, the contribution of women appears statistically insignificant – notwithstanding the key contributions of figures such as Marie Curie, Dorothy Hodgkin and Rosalind Franklin. Feminists have been

quick to point out the pitifully small numbers of women scientists.[6] This fact appears to suggest that there is something essential to science which is (and was) hostile to women. Even if we were to rewrite the history of science to incorporate women, it is difficult to shake off its negative picture: simply to 'add women' means iconizing the exceptional few, so reinforcing the negative picture of science in general. Moreover, the further back in time one goes, the harder it is to find a woman who fits the definition of 'scientist'. The Enlightenment can at least offer Madame du Châtelet, but can we really call her nearest equivalents, the *salonistes* of the seventeenth century, 'scientists', for all the interest shown by some in cosmology and new philosophy? Or should we be looking elsewhere? Or are we working with an uninstructive definition of the scientist? Is it not anachronistic to impose a modern definition on an earlier period, especially one when, as we have already observed, there was neither consensus on the nature of science nor a practice of enquiry identifiably equivalent to modern science?

Whether by accident or design, we have inherited a 'story of science' which is organized around the achievements of 'great' scientists who happen to be men. The 'great men' account of the history of science also happens to be a model which excludes not just women but other social inferiors: the technicians of science, for instance, who made experiments possible; the journeymen whose practical involvement afforded a model for reorganizing methods of investigation. It is ironic that Bacon himself singled out applied sciences such as navigation and printing as examples of the advancement of learning, yet the navigators and machine designers who made the progress in these areas do not feature in the 'story of science'.[7] The chronological proximity of a technologist such as Hugh Platt, who had developed a concept of new knowledge surprisingly similar to that of Bacon,[8] and who yet remains virtually unknown today, poses an unresolved question about the complexity of class and communication in the history of science. Similarly, in the history of medicine, the learned practitioners and theorists receive notice, but the lowly healers and midwives, the mere 'mechanicks' of medicine are left out of account. It has too quickly been forgotten that women of the early modern period had a developed technical knowledge in order to perform their social and economic functions. They could also handle abstract theory. Even though they were not card-carrying scientists, or members of the Royal Society, in their domestic roles women of the sixteenth and seventeenth centuries had plenty to do which is relevant to the history of science. As Bathsua Makin observed in 1673,

> To buy wooll and Flax, to die scarlet and purple, requires skill in natural philosophy.[9]

Overlaying the antithetical model of science history that overlooks the contribution of women to the history of science are the debates in feminist theory

which seek to address the question of whether science is and has been intrinsically biased against women.[10] Among those who have tried to answer this question by reference to the past, Evelyn Fox Keller and Carolyn Merchant lead the field.[11] A major problem with these studies is that the historical terrain which they have explored is itself restricted by the kinds of limitation of the traditional approach to the history of science just described. This underlines the urgency for new work of documentation. In trying to make visible women's involvement and to distinguish the factors which determine their exclusion or inclusion, we must be careful not to be imprisoned by the historical models we use. Instead of employing a historiographical approach which delimits the terrain so as to exclude categories of contribution, we need to examine a broad range of material, and avoid being constrained either by traditional or overly modern categories. In other words, to make women visible in the history of science we have to institute a rethink of the history of science itself.

A WAY FORWARD

The present collection aims to be neither comprehensive in its coverage nor definitive in its conclusions. Each of the studies presented here addresses, in one or more respects, the issues raised above. Together they offer a beginning point in the task of documenting and assessing the contribution of women in the history of science. Almost by definition, the women discussed constitute an excluded group, but, arguably, some are more excluded than others. It is, perhaps, easier to slot learned ladies such as Anne Conway and Margaret Cavendish (discussed by Sarah Hutton) into the familiar picture of the Scientific Revolution than to make space for 'mere factors and mechanicks' such as the lay-doctors and midwives of seventeenth-century London (the subject of studies by Margaret Pelling and Adrian Wilson). The apparently secondary relation of many women to their more famous husbands and brothers (as Frances Harris, Rob Iliffe and Frances Willmoth show) should not obscure the fact of the deep involvement in science of many women. A dominant theme is the relationship between women's involvement with scientific pursuits as a direct outcome of their social and domestic role, and the technical know-how and experience-based practice this brought with it. Competent housewifeliness, as Lynette Hunter shows, required skills in chemistry and medicine for even the most mundane of duties. Besides, as she argues in relation to Lady Ranelagh, as ladies became ladies of leisure, science too developed as the leisure pursuit of *virtuosi*.

While it is not always possible to document women's practising of science as a separate pursuit from 'Kitchin Physick', it is clear that many were sufficiently conversant with ideas on natural philosophy to engage in discussion. As economics, thought of as a valuable category of social recognition, expands from local community issues to embrace the finances of national capitalism, so too

does scientific experiment move from the household to the academic societies in order to achieve recognition. The examples of Mary Sidney (discussed by Margaret Hannay), Mary Evelyn (discussed by Frances Harris) and Lucy Hutchinson (the subject of Reid Barbour's study), as well as the aforementioned Cavendish and Conway, testify both to a high level of education among certain sections of the female population, and to the differing responses over the period to their application of that education to natural philosophy. The period from 1550 to 1700 also marks significant changes in the attitude to women's *public* participation in science. Much of the work by the women discussed in this collection exists in manuscript alone; some was printed after they died; very little was published in their names during their lifetimes. Publication as 'literature' rather than as 'natural philosophy' was far more acceptable, and clearly limited female involvement in technical and scientific matters. Yet as Elizabeth Tebeaux's study of the literature and literacy of technology indicates, the additional 'secondary relation' of women to printed work is fundamental to all aspects of this volume. The one chapter which sits apart from the rest by virtue of its male subject is Sarah Hutton's study of Bacon. This is the nearest any of the studies comes to addressing the terms of the current debate on science and gender. That this should be so demonstrates the underlying impetus of this collection, which is a concern to begin to shift the emphasis on men and their activities in much feminist commentary on early modern science towards the contributions of women. The bibliography at the end of the volume does not purport to be either comprehensive or definitive. Rather, by providing a unified list of sources and studies cited by each contributor, we hope that it might serve as a starting point for further study of women and early modern science.

The origin for the present collection was a series of four lectures held at Gresham College in 1995. The present book is an acknowledgement both of Gresham's past role in the history of science and of its new orientation, four centuries later, when women have a role which they were denied at its foundation. This is in no small part due to the Provost incumbent since 1988, Peter Nailor, who died during the period when this collection of papers was being assembled. One result, among many, of his scholarly visions was the lecture series out of which the initial papers came. The college is now in the careful hands of Dr Andreas Prindl. Thanks are equally due to the Academic Registrar, Maggie Butcher, whose intellectual imagination encouraged the series in the first place and nurtured it into existence.

The administrative staff of the School of English, University of Leeds have been supportive beyond any expectation, as have the staff of the Brotherton Library, Special Collections. We would particularly like to thank and record the valuable work of Dr Mark Robson, who compiled the index, assisted with editing and carried out picture research.

Lynette Hunter and Sarah Hutton, 1997

Notes

1 The classic study is Rupert Hall (1983). For a revisionist view, see Pumfrey, Rossi and Slawinski (1991). The novelty of seventeenth-century science has also been called in question by recent studies which have demonstrated the longevity of the Aristotelian tradition; see Henry and Hutton (1990).

2 Webster (1975).

3 See Shapin (1994), pp. 339–40, which reproduces the illustration of the experiment from Pascal's *Traitez de l'equilibre* (1663).

4 There is a large number of printed texts from the period outlining this concept of 'oeconomy', most occurring within discourses on the concept of civil behaviour, and reaching a peak in the first twenty years of the seventeenth century. For example, see Richard Robinson, *A morale methode of civille policie* (London, 1576), Thomas Ridley, *A View of the Civile and Ecclesiastical Law* (London, 1607), Joseph Hall, *Salomon's Divine Arts of Ethickes, Politickes, Oeconomickes* (London, 1609), T. D., *The Dove and Serpent* (London, 1614), and Daniel Toutcville, *St Pauls Threefold Cord* (London, 1635).

5 For an introductory list to these books, see L. Hunter (forthcoming).

6 Dale Spender (1982).

7 History of a science which focuses on the developments which prefigure modern science also rules out of account the explanatory theories and investigative practices that have fallen into disuse: the obvious example is alchemy – 'obvious' also because it is, to modern minds, clearly not a science. Yet that does not mean that alchemical investigative practices and practical knowledge did not feed into 'scientific' investigations of the natural world in the seventeenth century. On the interaction between alchemy, chemistry and medicine, see Clericuzio and Rattansi (1994).

8 See, for example, Platt's *The Jewell House of Art and Nature* (London, 1595).

9 Bathsua Makin (1673), p. 35.

10 The literature on feminism and science and the cognate topic of feminist epistemology is too vast to list here, but a serviceable bibliography of the subject can be found in Keller and Longino (1996). See also Harding (1986), Rose (1994), Tuana (1989).

11 Keller (1985), Merchant (1980), Schiebinger (1989).

1

THE RIDDLE OF THE SPHINX: FRANCIS BACON AND THE EMBLEMS OF SCIENCE

Sarah Hutton

They relate that Sphinx was a monster, variously formed having the face and voice of a virgin, the wings of a bird and the talons of a griffin. She resided on the top of a mountain, near the city of Thebes, and also beset the highways. Her manner was to lie in ambush and seize the travellers, and having them in her power, to propose to them certain dark and perplexed riddles, which, it was thought she received from the Muses, and if her wretched captives could not solve and interpret these riddles, she with great cruelty fell upon them, in their hesitation and confusion, and tore them to pieces. . . . This is an elegant, instructive fable, and seems invented to represent science, especially as joined with practice. For science may, without absurdity, be called a monster, being strangely gazed at and admired by the ignorant and unskilful. Her figure and form is various, by reason of the vast variety of subjects that science considers; her voice and countenance are represented female, by reason of her gay appearance and volubility of speech; wings are added, because the sciences and their inventions run and fly about in a moment, for knowledge, like light communicated from one torch to another, is presently caught and copiously diffused; sharp and hooked talons are elegantly attributed to her, because the axioms and arguments of science enter the mind, lay hold of it, fix it down, and keep it from moving or slipping away.

(Bacon, *The Wisdom of the Ancients*)[1]

Minerva by most writers was depictured in the shape of a young woman, of a liuely and fresh countenance, yet something threatening and angrie in hir lookes, her eyes were very fixe, assured and stedfast, and much like the colour of a blewish greene, or that of a troubled sea, and shee was armed complete at all peeces, with a long speare in one hand, & on hir other arme a shield or target, made of the purest Christall, on the top of her helmet was placed a garland, made of Oliue branches. . . . Touching the birth of her, it is written, that she was borne without a mother, and that shee issued and came forth into the world out of the head of Iupiter (according to the opinion of all the fantasticke Poets.) By which is meant & understood that all human knowledge