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REPORT

The history of science, medicine and technology at Oxford

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The history of science came early to Oxford. Its first champion was Robert T. Gunther, the son of a keeper of zoology at the British Museum and a graduate of Magdalen College who took a first there in the School of Natural Science in 1892, specializing in zoology (figure 1). As tutor in natural science at Magdalen (and subsequently a fellow) from 1894 until his retirement in 1920, at the age of 50, Gunther showed himself to be a fighter, both for the cause of science in the university and for the preservation of Oxford's scientific heritage. His first work, *A history of the Daubeny Laboratory* (1904), reflected his devotion to the memory of the laboratory's founder and Magdalen's greatest man of science, Charles Daubeny, who had held chairs of chemistry, botany and rural economy at various times, for long periods simultaneously, between 1822 and his death in 1867.[1] Supplements, bearing the main title *The Daubeny Laboratory register*, followed in 1916 and 1924,[2] but it was Gunther's *Early science in Oxford*, published in 14 substantial volumes between 1920 and 1945, that signalled his definitive move from science to history.[3]

World War I brought home to Gunther the vulnerability of Oxford's scientific collections, in particular the many early instruments that survived, largely disregarded, in the colleges. The gem, for Gunther, was the cabinet of mathematical and scientific apparatus that Charles Boyle, fourth Earl of Orrery, had bequeathed to his college, Christ Church, on his death in 1731. But the gem by no means represented the whole. The first three volumes of *Early science in Oxford* (1920–25) bear witness to the sheer quantity of instruments, specimens and records that Gunther had inventoried, ranging from the medieval astrolabes at Merton College to the anatomical, geological and other historic collections that were still being added to in many colleges and university departments in the early twentieth century. Once the finest of the instruments had been gathered and displayed for a special exhibition in the Bodleian Library in 1919,[4] no one could doubt the richness of Gunther's finds, and, with the bit now firmly between his teeth, he turned to the search for a permanent location, not only for the objects shown in the Bodleian but also for those that were offered to the university in 1922 by the private collector Lewis Evans, the younger brother of the archaeologist and keeper of the Ashmolean Museum from 1884 to 1908, Sir Arthur Evans.

The location that Gunther coveted was the Old Ashmolean Building in Broad Street. Inaugurated in 1683 as a setting for the pursuit of the new philosophy of the seventeenth century, the Old Ashmolean had been used for a miscellany of purposes since 1894, when the opening of the Ashmolean Museum's new premises in Beaumont Street had provided a much-needed home for the university's collections of art and antiquities (some of which had been

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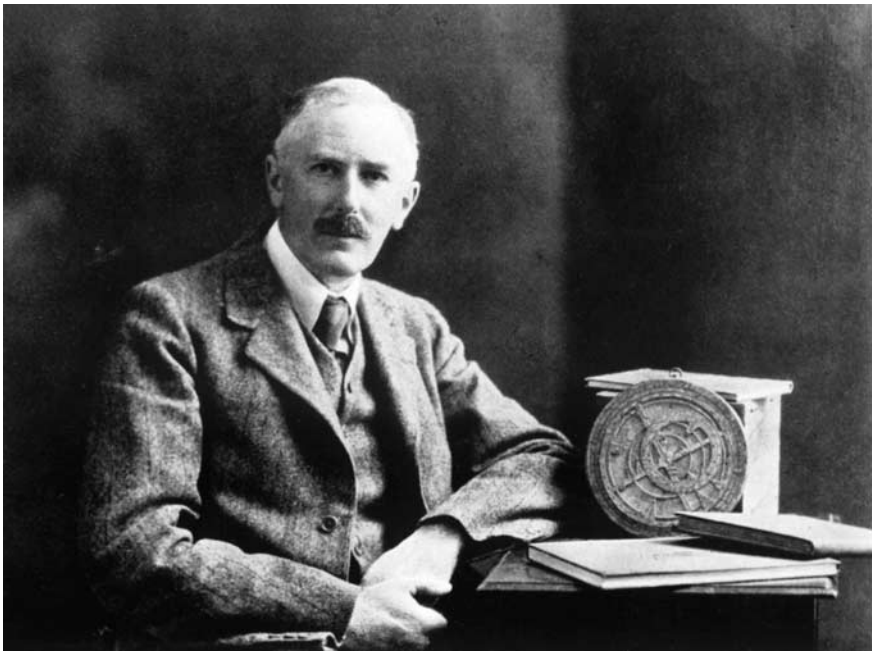

Figure 1. Robert Gunther, *ca*. 1930, with a wood and pasteboard astrolabe by the seventeenth-century Oxford instrument maker John Prujean. (Photograph reproduced by courtesy of the Museum of the History of Science, Oxford.)

housed in Broad Street). Opposition to Gunther's plan, notably from the keeper of the Ashmolean, D. G. Hogarth, was strong, and it required a combination of the tenacity of Gunther and Evans, the offer of £1000 by the Goldsmiths' Company, and an intervention by the Chancellor of the university, Lord Curzon, to win the day. In 1925, the top floor of the Old Ashmolean Building was adapted for the display of the assembled collections, and after another 20 years, punctuated by friction of every kind, the building was finally opened on all three floors with its present formal designation as the Museum of the History of Science (figure 2).[5]

From its origins in the 1920s, the museum has been directed by a succession of eminent scholarly curators: Gunther (until his death in 1940), Frank Sherwood Taylor (1940–50), C. H. Josten (1950–64), Francis Maddison (1964–94) and, since 1994, Jim Bennett. Under them and some distinguished assistant curators, among them Gerard Turner, Will Ryan, John North, Willem Hackmann and the present assistant keeper, Stephen Johnston, it has established its reputation as a world-class resource for research in the history of instruments and the material culture of science. In recent years, it has also developed strongly as a centre for teaching, in contrast with the early days of this activity, when the role of pacemaker was assumed by individuals working outside the museum, uniformly with little success. A history of science research unit, hosted by the Bodleian Library, was set up in 1914, and in 1920 the person in charge of it, Charles Singer, was appointed to a lecturership in the history of the biological sciences, which we believe to be the first history of science post in a British university.[6] The initiative proved abortive, however, because by 1920 the Bodleian's patronage of the unit had already been withdrawn and Singer was simultaneously discovering more fertile territory in London, at University College. Equally innovative and equally ineffectual was the appointment of J. K. Fotheringham as reader in ancient astronomy in

Figure 2. Museum of the History of Science, in the Old Ashmolean Building, Broad Street. The building was constructed in 1683 for the study and dissemination of the new philosophy of the seventeenth century.

1925; like Gunther's appointment as reader in the history of science in 1934, this was an *ad hominem* accolade, not an established teaching post. Oxford's first systematic and examined teaching in the history of science had to await the exceptional circumstances of World War II, when Taylor lectured in the museum to military cadets. Regular lecture-courses continued to be offered after the war, notably by Taylor and the historian and chemist Stephen Mason (who held the title of departmental demonstrator in the museum), but Taylor's efforts to establish a proper syllabus and persuade the university (rather than the museum) to take responsibility for it did not bear fruit until 1953.

It was in that year that Alistair Crombie (figure 3) moved from a lectureship in the history and philosophy of science at University College London to become the university's first lecturer in the history of science. Crombie had begun his academic career in his native Australia and then in Cambridge as a physiologist, but his main historical interests extended across the whole range of the sciences and philosophy in the medieval and early modern periods. His *Augustine to Galileo* (1952)[7] and *Robert Grosseteste and the origins of experimental science 1100–1700* (1953)[8] elaborated his core perception of the elements of continuity between medieval discussions of method and those that fed into the approaches to the study of nature that had become established by the end of the seventeenth century. The conviction that science should be treated as a rational activity and not merely a social one informed both of these books, as they also informed the three magisterial volumes of his *Styles of scientific thinking*, which appeared in 1994, two years before his death.[9]

Despite an unwavering commitment to his own style of work, Crombie was sensitive to changes and new departures in the discipline. The international conference on 'The structure of scientific change' that he organized, with Rom Harré (then recently appointed as university lecturer in the philosophy of science), in Oxford in 1961 reflected this openness and, through

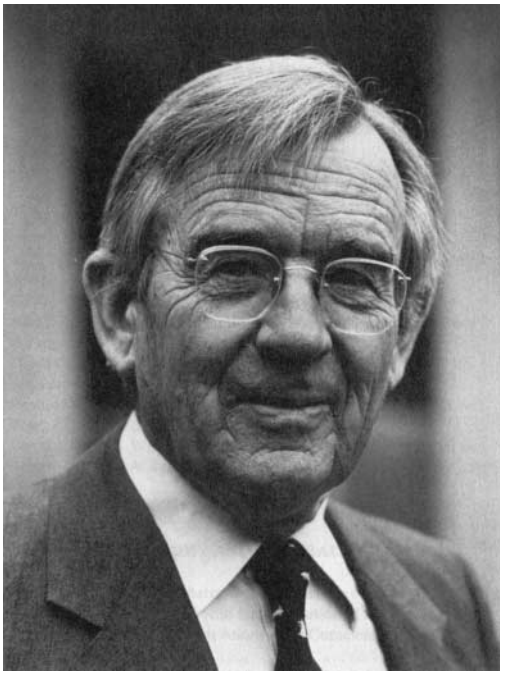

Figure 3. Alistair Crombie FBA, Lecturer in the History of Science, University of Oxford, 1953–83. (Copyright © Gabriel Amadeus Cooney.)

the resulting volume of essays,[10] contributed to the fundamental rethinking of the methodological foundations of the history of science that marked the 1960s and 1970s. As a teacher, Crombie was most successful with advanced students, and his seminar, organized by himself or at various times jointly with Rom Harré, John North or Wilma George, was a formative experience for doctoral candidates as well as being a meeting point for more senior members of the university with interests in the history and philosophy of science and for the numerous visiting scholars whom Crombie attracted to Oxford. At undergraduate level, Crombie was less active, but in 1965 he devised and launched a special subject on 'The scientific movement in the seventeenth century', which remains, 40 years on and after certain modifications, a popular choice among final-year historians. Currently convened by Laurence Brockliss, the special subject has about ten candidates a year. Penelope Gouk, senior lecturer in the School of Arts, Histories and Cultures at the University of Manchester, and Scott Mandelbrote, a fellow of Peterhouse, Cambridge, are just two history graduates who have gone on from the special subject to postgraduate research and an academic career in the history of science.

The early 1970s saw a significant strengthening of the subject, with the creation of a chair in the history of science and a readership in the history of medicine. The appointment of Margaret Gowing (figure 4) to the chair caused surprise in some circles. After training as an economic historian at the London School of Economics, Gowing had entered the civil service, in which from 1945 she worked under Sir Keith Hancock on the civil history of World War II, a project that ran to 27 volumes, including two jointly authored by Gowing.[11] However, it was as historian and archivist to the United Kingdom Atomic Energy Authority and later as reader in contemporary history at the University of Kent that Gowing pursued her

Figure 4. Margaret Gowing CBE FRS FBA, Professor of the History of Science, 1973–86. Professor Gowing shared with Karl Popper and Joseph Needham the rare accolade of fellowship of both the Royal Society and the British Academy. (Copyright © Billet Potter, Oxford.)

most notable research. Her *Britain and atomic energy, 1939–1945* (1964)[12] and the two volumes of her *Independence and deterrence. Britain and atomic energy, 1945–1952* (1974)[13] were written in these years, establishing her as the outstanding historian of Britain's engagement, civil and military, in atomic energy. Arriving in Oxford in January 1973, she found the kind of history she did hard to promote within the Modern History Faculty, and she always stood somewhat apart from faculty affairs. Her main affection in Oxford was for her college, Linacre, and much of her energy was expended on the establishment of the Contemporary Scientific Archives Centre, to which, from 1973, the papers of eminent scientists were brought from all over the country for cataloguing before being deposited in whatever was the most appropriate university or other institutional archive. It was a great loss to Oxford when, after Gowing's retirement in 1986, the centre moved to the University of Bath, where, as the National Cataloguing Unit for the Archives of Contemporary Scientists, it continues its work under the direction of Peter Harper.

In the same academic year as Gowing took up her appointment, the readership in the history of medicine brought another outstandingly gifted historian to Oxford: Charles Webster. In the Department of Philosophy at the University of Leeds since the mid-1960s, Webster had laid the foundations for his monumental study of the Baconian tradition in seventeenth-century science, *The Great Instauration. Science, medicine, and reform, 1626–1660*, which appeared in 1975 (since reissued, with a new 20-page introduction).[14] In Oxford he combined his research and teaching on early modern science,[15] including a continuing interest in Paracelsus, with a parallel commitment to the history of the National Health

Service. The two volumes of Webster's history of the NHS that appeared in 1988 and 1996 stand as enduring testimony to the intensity of his engagement and his deftness in the writing of an immensely complex institutional study.[16]

As reader, Webster also directed the Wellcome Unit for the History of Medicine from its foundation in 1972, building it into one of the leading British centres for research and teaching in the history of medicine. After Webster's departure to a senior research fellowship at All Souls College in 1988, successive directors—Richard Smith, Jane Lewis and Mary Dobson—sought to maintain the momentum he created through a difficult period of transition, and all placed their stamp on the Unit. Now, under Mark Harrison, an Oxford DPhil who moved back to Oxford from a post at Sheffield Hallam University to become reader and director in 2001, the work of the Unit is devoted primarily, though not exclusively, to the history of tropical medicine and infectious diseases. Within this broad profile of research, scholars attached to the Unit, including Harrison himself,[17] are currently engaged in a wide variety of projects, such as the history of hospitals in the developing world, medicine and colonial expansion since 1700, the relations between warfare and medicine, and the history of veterinary medicine.

In its vigour and focused programmes of research, the Wellcome Unit of today is able to build on over three decades in which successive readers, graduate students (many of them now in posts in other universities), visiting scholars and research fellows have made it a major focus not only for research but also for external research funding, of which the Wellcome Trust Strategic Award (to support the Unit's work in the history of tropical medicine and infectious diseases) is a notable recent example. Among the distinguished historians who have been members of the Unit, Margaret Pelling, working mainly on medicine in early modern England,[18] and Paul Weindling, a specialist in the history of medicine and the life sciences in continental Europe, most notably in Germany,[19] have played especially important roles. After coming to Oxford from Australia as a graduate student, Pelling took a large share in the administration of the Unit for many years before becoming reader in the social history of medicine in 1998. An Oxford graduate who took his PhD at University College in London, Weindling joined the Unit as a research assistant in 1978. He eventually became reader in the history of medicine and in 1998 moved to a Wellcome Trust research professorship in the history of medicine at Oxford Brookes University. Now, in 2005–06, the Unit houses eight postdoctoral researchers, including Pratik Chakrabarti, a historian of science and medicine in British India who was until recently the Unit's deputy director.[20]

In the difficult times through which Oxford, like all universities, has passed in recent years, the task of promoting the growth of the discipline has not been easy. But one conspicuous success has been the establishment, in 2003, of MSc and MPhil programmes, lasting one and two years respectively, in the History of Science, Medicine and Technology. These new degree schemes, which bring together options that began life in the early 1990s under the aegis of the MSc and MPhil in Economic and Social History, start with a common core of methodologically oriented teaching in the first term and thereafter allow students great freedom in the choices they make from an extensive menu of specialized advanced papers and in the selection of a topic for their compulsory dissertation. In this way, students can orient their interests towards either the history of science and technology or the history of medicine and, for those of them wishing to move on to more advanced work, lay the foundations for doctoral research. Another important advance at Master's level has been the launching of the MSc in History of Science (Instruments, Museums, Science, Technology) in 1996. Taught in the Museum of the History of Science, this course makes equal use of

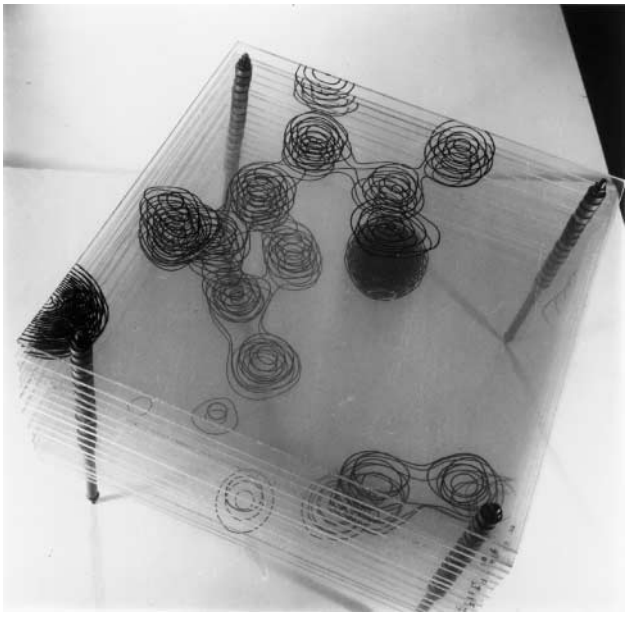

Figure 5. Dorothy Hodgkin's innovative three-dimensional electron density model of penicillin, dating from the 1940s. The model, preserved in the Museum of the History of Science (inventory number 17631), represents at once one of Oxford's best-known contributions to medicine, the clinical development of penicillin in 1940, and an important piece of pure biochemical research that followed in its wake: the discovery of the structure of penicillin by means of X-ray crystallography in 1942. Both achievements led to Nobel prizes. (Photograph reproduced by courtesy of the Museum of the History of Science, Oxford.)

artefacts and more conventional textual evidence as resources for the study of scientific instruments and their role in the history of science and technology from antiquity to the early twentieth century. Like the MSc and MPhil in History of Science, Medicine and Technology, it provides a training for doctoral work, but it also stands independently as a preparation for careers in museums, where a number of former students are now employed.

The Master's programmes have had the effect of integrating work in the history of science, medicine and technology more closely than before in the wider profile of teaching within the History Faculty. This integration has had important consequences for our strategy for the subject, at undergraduate as well as at graduate level. For a long time, from the mid-1960s, the special subject on 'The scientific movement in the seventeenth century' provided the only opportunity for work in the history of science that the Faculty offered its undergraduates. But finalists in history are now able to choose a paper (from among the Faculty's 'further subjects') on 'Intellect and culture in Victorian Britain', which includes a substantial element of history of science. The Faculty also offers an optional subject, 'Gunpowder, compass and printing press: technology in Renaissance and early modern Europe', to undergraduates working for the first-year ('preliminary') examination; the course, currently taught by Stephen Johnston, Christina Dondi and Robert Fox, uses the resources of the Museum of the History of Science and the Bodleian Library as well as an innovative website carrying a rich selection of set texts and images. Most recently, 2005–06 has seen the launching of a new further subject for undergraduate historians. Entitled 'Medicine, empire, and improvement', and taught jointly by Mark Harrison and Margaret Pelling, this course has brought the history of medicine into the history syllabus for the first time.

For a subject that is essentially interdisciplinary, however, the History Faculty can never be our sole context, and the links with departments of science and medicine and other departments and institutions in Oxford are strong. Teaching in the history of medicine, for example, is offered to medical students; chemists have the option of devoting their fourth (Part II) year to writing a thesis in the history of chemistry; a two-term course on History and Philosophy of Science, taught jointly with colleagues in the philosophy of science (for many years with Rom Harré and more recently with Simon Saunders), is a popular Supplementary Subject available to second-year undergraduates throughout the School of Natural Science; and both a 'short option' based on this course and a course on the history of electromagnetism (taught by John Roche) are offered to undergraduates reading physics. At the research level, John Rowlinson's *Cohesion. A scientific history of intermolecular forces* (2002)[21] is a fine example of historical writing by a distinguished colleague in the sciences, while a recent collaborative volume on the history of physics in Oxford up to World War II has underlined the potential for work on and in the university's science departments.[22] The archive room that John Sanders created more than a decade ago in the Clarendon Laboratory, after his retirement as a university lecturer in physics and fellow of Oriel College, was an essential resource for this project and it stands as a reminder of the importance of preserving the artefacts and records of modern science in Oxford.[23] Here, as in all universities, the past of science is all too easily treated with negligence when laboratories are refurbished or demolished. With constant vigilance as the only protection, the Museum of the History of Science has made an important contribution to the preservation not only of instruments from Oxford laboratories but also of the rich store of printed and manuscript sources now in the care of the museum's archivist, Tony Simcock (figure 5). Recent plans for the removal of the Department of Biochemistry into new premises raised a familiar alarm, although in this case discussions are now well in train with a view to protecting a small but valuable collection illustrating the department's history.

Beyond Oxford, the international character of science is mirrored in a number of active collaborations with foreign institutions and groups. The Museum of the History of Science is typical in the close links it maintains with the Museum Boerhaave in Leiden and the Museo di Storia della Scienza in Florence. One substantial outcome of these links has been the online Epact database (http://www.mhs.ox.ac.uk/epact), created in a partnership also involving the British Museum. As the leading collection of its type in the world, the Museum of the History of Science has strong international connections on other fronts as well. By hosting the online bibliography and online instrument register of the Scientific Instrument Commission of the International Union of History and Philosophy of Science, for instance, it serves the interests of the international community of historians of instruments (http://www.sic.iuhps.org). With Jim Bennett as president of the commission, Oxford was pleased to host the commission's international symposium in 2000.

The museum's associations with Leiden and Florence underline the prominence that Europe has always had in Oxford's work in the discipline. Within the History Faculty, a continuing programme of research on the history of science, technology and society in industrial Europe has resulted in several jointly authored publications arising from Oxford-based collaborations between Robert Fox, research fellows (notably Anna Guagnini and Agustí Nieto-Galan) and other colleagues in Britain and abroad.[24] The Maison française d'Oxford (MFO), a research centre financed by the French Ministry of Foreign Affairs in association with the Centre national de la recherche scientifique (CNRS), has been essential to this as to other aspects of the Oxford group's work. The three-year cycle of conferences on

'Transmission and understanding in the sciences', organized by Robert Fox and Ian Maclean, is just the latest in a series of collaborative initiatives on the European scale in which the history of science has been generously supported by successive directors of the MFO, most recently (since 2003) Alexis Tadié.[25] The initiatives have benefited from the regular presence at the MFO of research fellows and graduate students in the history of science from France; at present Stéphane van Damme, a specialist in seventeenth- and eighteenth-century science and a *chargé de recherche* in the CNRS, with an attachment to the Centre Alexandre Koyré in Paris, is in Oxford for a period of four years to lead the MFO's very enterprising history of science programme. Another European collaboration, with Estonian historians of science and medicine at the University of Tartu, has been made possible by a grant from the Royal Society, while a regularly renewed agreement with the history of science group at the University of Bologna, supported by the Europaeum network of universities, has facilitated conferences and reciprocal visits, including that of Anna Guagnini, a historian of modern industrial technology and former postdoctoral fellow in our group who is back in the History Faculty until January 2006, on leave from her post in the Department of Philosophy at Bologna.[26]

In the history of medicine, even more extensive links have been made with colleagues in India, East Africa and Latin America. These not only reflect the Wellcome Unit's research priorities but also stand as an essential stimulus to a discipline that faculties and departments of history at the dawn of the twenty-first century can no longer see as the decorative but marginal byway that conventionally trained historians of an earlier generation all too often thought it to be. The Unit is currently developing a particularly close association with historians at the University of Kolkata, with whom it is collaborating to establish the first centre for research and teaching in the history of medicine in India.

The strength of Oxford's scientific, medical and mathematical traditions since the Middle Ages makes the university a natural home for the history of science, medicine and technology. The Bodleian and Radcliffe Science Libraries, with more than seven million books and rich archives, along with the collections of the Museum of the History of Science, other museums (notably the University Museum of Natural History) and the more important college libraries, are established resources that offer rich opportunities for exploiting the discipline's potential. Increasingly, though, we depend on outside funding. Here, a particularly important development in the 1990s was the securing of a National Heritage Lottery Fund grant of £1.2 million towards the cost of the enlargement and total refurbishment of the Museum of the History of Science. At the cost of three years of closure, Jim Bennett and his colleagues now have a seminar room, enhanced office and display space, and an improved reading-room and store for the museum's specialist library of 15 000 books. Since reopening in its enlarged premises and with better facilities, the museum has pursued a vigorous public programme of exhibitions, lectures and special events of many kinds.[27] It is an important window for the history of science, a place where academics and museum curators can communicate directly with the public and demonstrate the interest and relevance of their subject.

After some years of difficulty, the news about appointments has also become more encouraging. The creation of a new university lecturership in the history of medicine has been especially welcome, and Sloan Mahone, a specialist in psychiatric medicine in East Africa who took her DPhil in the Wellcome Unit in 2004, has now taken up the post. Likewise, the anxiety that followed the retirement of Gillian Lewis, a specialist in early modern science and a leading contributor to the 'Scientific movement' special subject, was allayed earlier in the

year by the decision to fill the post promptly. As a result, Howard Hotson, who completed his DPhil thesis on Johann Heinrich Alsted in 1991, has now returned to Oxford from the chair in early modern history that he held at the University of Aberdeen. He succeeds Dr Lewis as a CUF (Common University Fund) lecturer in history and fellow of St Anne's College.[28] Finally, it is a personal pleasure for me to note that I shall have a successor immediately after my retirement from the chair of the history of science at the end of the present academic year. To the Faculty's great satisfaction, Pietro Corsi, currently professor at the Sorbonne, has accepted the post with effect from October 2006.

My own priorities, since I arrived as Gowing's successor in the chair, have been twofold. The first has been to strengthen still further the international dimension of the Oxford group's work; this has squared well both with my own main research interests (in European and, more particularly, French science and technology since the eighteenth century) and with those of my colleagues.[29] The second has been to maintain and, where possible, enhance the coherence of the history of science, medicine and technology as a subject area in research and teaching at both undergraduate and postgraduate levels. The challenge of achieving coherence in the diffused structures of Oxford can never be straightforward, and the history of science, medicine and technology offers no exception to that rule. Within the university, the discipline has several focuses. The Museum of the History of Science and the Wellcome Unit for the History of Medicine are the main ones, along with the History Faculty, in which, both physically (with rooms in the Faculty building) and institutionally, the chair is located. But a number of colleagues holding college appointments or other posts not formally defined as falling within the area of the history of science, medicine and technology also make important contributions to research and teaching in the discipline. Current work in the history of early modern science and medicine, for example, is greatly strengthened by the contributions of Ian Maclean, Robin Briggs and Noel Malcolm, all senior research fellows of All Souls College.[30] For some years, the college has been the setting for a weekly graduate seminar in each Hilary Term, and from time to time a series has led on to a collective volume: two such volumes currently awaiting publication by Oxford University Press are *Heterodoxy in early modern science and religion*, edited by John Brooke and Ian Maclean (due out in December 2005) and *The Hartlib papers. A universal correspondency*, edited by Scott Mandelbrote and due out in 2007. In the early modern period too, Laurence Brockliss, professor of early modern French history and a fellow of Magdalen College, and Paul Slack, professor of early modern social history and principal of Linacre College, contribute much to work in the history of medicine.[31]

Beyond the History Faculty, in the history of the relations between science and religion, we are able to draw on a close association with John Brooke, Andreas Idrios professor of science and religion in the Faculty of Theology. As part of this association, historians of science not only participate in Professor Brooke's graduate seminars but also contribute to the teaching of the Master of Studies degree in Science and Religion, which he convenes. On the history of science in the Islamic tradition, the Oriental Institute has long been a focus for research and teaching, chiefly through the work of Emilie Savage-Smith, a senior research associate in the Institute, and Fritz Zimmermann, university lecturer in Islamic philosophy, while the history of Islamic technology has been an important speciality within the Ashmolean Museum, chiefly through the work of James Allan, recently retired as keeper of Eastern Art.[32] The history of mathematics has similarly depended heavily on colleagues in other faculties. In this area, Peter Neumann, university lecturer in mathematics and a fellow of The Queen's College, Robin Wilson, a fellow of Keble College, Raymond Flood,

university lecturer in computing studies and mathematics and a fellow of Kellogg College, Keith Hannabuss, Billmeier fellow and tutor in mathematics at Balliol College, and Jackie Stedall, a junior research fellow in mathematics at Queen's, have been at the heart of a lively community of historians with strong links to the history of mathematics group at the Open University and the British Society for the History of Mathematics.[33] Oxford has also been fortunate in being able to benefit from the presence of distinguished colleagues living in retirement in Oxford: John Heilbron, John North and Gerard Turner are three of a number of local residents, all of them retired from senior positions within the university or elsewhere, who contribute much to the history of science community's scholarly life and in some cases to teaching and graduate supervision as well.[34] Independent scholars too, notably Allan Chapman and John Roche, have an important role.

One of the most distinctive developments in recent years has been the growth in the size of the community of graduate students in the history of science, medicine and technology. That community now numbers more than 50, all of them full-time students (as the Oxford regulations make necessary) either working for one of the Master's degrees or writing doctoral theses. Such a number calls for and makes possible a diverse programme of research seminars, conferences, informal reading groups and lecture-series, in the Faculty, the Wellcome Unit and the Museum of the History of Science, as well as in college contexts. Some of these activities have resulted in books, such as *The garden, the ark, the tower, the temple*, edited by Jim Bennett and Scott Mandelbrote (1998),[35] and *Thomas Harriot. An Elizabethan man of science*, edited by Robert Fox (2000).[36] With more than 15 new postgraduate students due to arrive in October 2005, the community continues to grow. In this respect, developments at the Saïd Business School, where the sociologist Steve Woolgar arrived from Brunel University as professor of marketing in 2000, are already having an impact. Although Woolgar's chair and the school's James Martin Institute for Science and Civilization are not primarily historical in their focus, they provide a setting in which history is seen as a contributing discipline within the broader field of science and technology studies.[37] The context of the Saïd Business School is emerging as a promising one for our discipline. In this respect, we see the recent appointment of the historian and policy analyst Jerry Ravetz to the position of part-time visiting fellow in the James Martin Institute as an encouraging step forward in the integration of the history of science with the concerns of scholars studying the science and technology of the present and the future as well as of the past.

Growth and diversity have their dangers, of course. But the constituent elements of Oxford history of science, medicine and technology have worked hard to maintain a sense of integration and common purpose in the face of an unusually complex administrative structure. Pressures arising from successive Research Assessment Exercises and the demands for accountability intrude in Oxford, as they do everywhere. Yet even the busiest academic lives seem to find some scope for elasticity, and research projects, both personal and collaborative, plans for conferences, and recent books and others in press suggest—miraculously, I often feel—that heads are still above water.

Acknowledgements

I am grateful for the comments on earlier drafts of this article that I have received from Jim Bennett, Mark Harrison, Ian Maclean, Margaret Pelling, Emilie Savage-Smith and Tony Simcock.

Notes

1 R. W. T. Gunther, *A history of the Daubeny Laboratory, Magdalen College Oxford* (Oxford University Press, 1904).

2 R. W. T. Gunther, *The Daubeny Laboratory register 1904–1915* (printed in Oxford for the subscribers by Oxford University Press, 1916); *The Daubeny Laboratory register 1916–1923* (printed in Oxford for the subscribers by Oxford University Press, 1924).

3 R. W. T. Gunther, *Early science in Oxford* (14 volumes) (privately printed in Oxford, variously 'for the subscribers' and 'for the author', 1920–45).

4 *Catalogue of a loan exhibition of early scientific instruments in Oxford opened by Sir William Osler after his presidential address to the Classical Association on 16 May 1919* (Clarendon Press, Oxford, 1919).

5 On Gunther's campaign and his role in the founding of the museum, see the account by A. V. Simcock, the museum's archivist and former librarian, in *Robert T. Gunther and the Old Ashmolean* (Museum of the History of Science, Oxford, 1985).

6 I am indebted to Tony Simcock for his perception of Singer's time in Oxford. More generally, on this early period in the development of the discipline, see Simcock, *op. cit.* (note 5), pp. 65–75, and J. B. Morrell, *Science at Oxford 1914–1939. Transforming an arts university* (Clarendon Press, Oxford, 1997), pp. 261–263. On Singer, see also Charles Webster, 'Medicine as social history: changing ideas on doctors and patients in the age of Shakespeare', in L. G. Stevenson (ed.), *A celebration of medical history* (Johns Hopkins University Press, Baltimore, MD, 1982), pp. 103–126.

7 A. C. Crombie, *Augustine to Galileo. The history of science A.D. 400–1650* (Falcon Educational Books, London, 1952; since reissued under various imprints).

8 A. C. Crombie, *Robert Grosseteste and the origins of experimental science 1100–1700* (Clarendon Press, Oxford, 1953; reissued in 1971 by Clarendon Press).

9 A. C. Crombie, *Styles of scientific thinking in the European tradition. The history of argument and explanation especially in the mathematical and biomedical sciences and arts* (3 volumes) (Duckworth, London, 1994).

10 A. C. Crombie (ed.), *Scientific change. Historical studies in the intellectual, social and technical conditions for scientific discovery and technical invention from antiquity to the present. Symposium on the history of science, University of Oxford, 9–15 July 1961* (Heinemann, London, 1963).

11 W. K. Hancock and M. M. Gowing, *British war economy* (HMSO, London, 1949); E. L. Hargreaves and M. M. Gowing, *Civil industry and trade* (HMSO, London, 1952).

12 M. M. Gowing, *Britain and atomic energy, 1939–1945* (Macmillan, London, 1964).

13 M. M. Gowing (assisted by Lorna Arnold), *Independence and deterrence. Britain and atomic energy, 1945–1952* (2 volumes) (Macmillan, London, 1974).

14 C. Webster, *The Great Instauration. Science, medicine, and reform, 1626–1660* (Duckworth, London, 1975; Holmes & Meier, New York, 1976; 2nd edition published by Peter Lang, Bern, 2002).

15 For example, as the supervisor of the DPhil thesis of Mordechai Feingold on 'Science, universities and society in England 1560–1640' (1980), which led on to Feingold's book, *The mathematical apprenticeship. Science, universities and society in England, 1560–1640* (Cambridge University Press, 1984).

16 C. Webster, *Problems of health care. The National Health Service before 1957* (HMSO, London, 1988); *Government and health care. The National Health Service 1958–1979* (HMSO, London, 1996). See also the same author's *The National Health Service. A political history* (Oxford University Press, 1998; 2nd edition published by Oxford University Press, 2002).

17 Harrison's own special interests, in war, imperialism, and medicine since 1700, are reflected in his main books: *Public health in British India. Anglo-Indian preventive medicine 1859–1914*

(Cambridge University Press, 1994), *Climates and constitutions. Health, race, environment and British imperialism in India 1600–1850* (Oxford University Press, 1999), and *Medicine and victory. British military medicine in the Second World War* (Oxford University Press, 2004). *Medicine and victory* won the 2004 Templer medal book prize of the Society for Army Historical Research. See also the jointly authored volume: M. Harrison, S. Bhattacharya and M. Worboys, *Fractured states. Smallpox, vaccination and public health policy in British India, 1800–1947* (Orient Longman, Hyderbad, 2005).

18 An important recent fruit of Pelling's work in this area is her book (with Frances White) *Medical conflicts in early modern London. Patronage, physicians, and irregular practitioners 1550–1640* (Clarendon Press, Oxford, 2003). She has also prepared a valuable database of fellows of the College of Physicians of London and other medical practitioners between 1550 and 1640. This is available via the history of science portal (http://histsciences.univ-paris1.fr/databases/cpl) organized from the Université de Paris I (Sorbonne) by Pietro Corsi. An Oxford DPhil who worked with Charles Webster in the late 1970s, Corsi published an extended version of his thesis as *Science and religion. Baden Powell and the Anglican debate, 1800–1860* (Cambridge University Press, 1988).

19 See, as an example of the work that Weindling published during his time in the Unit, *Health, race and German politics between national unification and Nazism, 1870–1945* (Cambridge University Press, 1989).

20 P. Chakrabarti, *Western science in modern India. Metropolitan methods, colonial practices* (Permanent Black, New Delhi, 2004).

21 J. S. Rowlinson, *Cohesion. A scientific history of intermolecular forces* (Cambridge University Press, 2002).

22 R. Fox and G. J. N. Gooday (eds), *Physics in Oxford 1839–1939. Laboratories, learning, and college life* (Oxford University Press, 2005). The collaboration that led to this volume had its origins in the years 1992–94, when Graeme Gooday was attached to the Modern History Faculty as a Royal Society/British Academy Postdoctoral Fellow.

23 A grant from the Nuffield Foundation allowed an inventory of instruments, photographs, audio tapes and other records to be prepared by Katherine Watson; see K. D. Watson, *Sources for the history of science in Oxford* (Modern History Faculty, Oxford, 1994). The inventory for the Department of Physics is on pp. 1–33; those for other science departments occupy the rest of Dr Watson's book. A revised inventory, updated by Dr Sanders and currently by his successor as the department's archivist, Dr Jim Williamson, recently retired as university lecturer in physics and a fellow of St Cross College, is accessible on the departmental website (http://www.physics.ox.ac.uk/history.asp).

24 See, for example, R. Fox and A. Guagnini (eds), *Education, technology and industrial performance in Europe, 1850–1939* (Cambridge University Press; Éditions de la Maison des Sciences de l'Homme, Paris, 1993), R. Fox and A. Nieto-Galan (eds), *Natural dyestuffs and industrial culture in Europe, 1750–1880* (Science History Publications, Canton, MA, 1999), and R. Fox and A. Guagnini, *Laboratories, workshops, and sites. Concepts and practices of research in industrial Europe, 1800–1914* (Office for History of Science and Technology, University of California, Berkeley, CA, 1999).

25 Papers from these conferences have appeared variously in both hard copy and electronic form. See, for example, R. Fox (ed.), *Centre and periphery revisited. The structures of European science, 1750–1914*, a special issue of the *Revue de la Maison française d'Oxford*, vol. 1, no. 2 (2003), and the papers (now on the MFO's website at http://www.mfo.ox.ac.uk) from the conference on 'History and the public understanding of science', held at the MFO on 28 and 29 May 2004.

26 The association with Bologna has resulted in workshops and numerous other contacts at both postgraduate and faculty levels. See, for example, the volume of papers arising from an Oxford–Bologna workshop on laboratories: A. Guagnini (ed.), *I laboratori dell'università* (Centro internazionale per la storia delle università della scienzia, Università di Bologna, 1996).

27 For details, see the museum's website (http://www.mhs.ox.ac.uk), which also carries a number of online versions of past exhibitions.

28 CUF lectureships are financed jointly by a college and the university, unlike university lectureships, which are entirely the responsibility of the university.

29 My most recent personal priority in research has been the completion of a book on French science in the 'long' nineteenth century: *Science, scientism, and the savant. The public face of natural knowledge in France, 1814–1918* (MIT Press, Cambridge, MA, and London, to appear in 2007). Valuable support in the promotion of the international dimension of work in Oxford has come from a number of organizations. These include the International Union of History and Philosophy of Science, of which I was president from 1995 to 1997, the newly formed European Society for the History of Science, to whose presidency I was elected in 2004, and the European Science Foundation, where Ian Maclean serves on the steering committee for the ESF's research programme in the history of science, 'From natural philosophy to science'.

30 As examples of these contributions, see I. W. F. Maclean, *Logic, signs and nature in the Renaissance. The case of learned medicine* (Cambridge University Press, 2001), R. Briggs, *Communities of belief. Cultural and social tension in early modern France* (Clarendon Press, Oxford, 1989), and N. Malcolm, *Aspects of Hobbes* (Clarendon Press, Oxford, 2002).

31 See, for example, L. W. B. Brockliss, *Calvet's web. Enlightenment and the republic of letters in eighteenth-century France* (Clarendon Press, Oxford, 2002), and P. Slack, *The impact of plague in Tudor and Stuart England* (Routledge & Kegan Paul, London, 1985).

32 Savage-Smith, Zimmermann, and Allan, all of them fellows of St Cross College, have done much, with other colleagues (including Francis Maddison, the former curator of the Museum of the History of Science), to promote the study of Islamic science and technology in Oxford. See, for recent examples of their work, E. Savage-Smith (with contributions by G. J. H. van Gelder *et al.*) *A descriptive catalogue of oriental manuscripts at St John's College Oxford* (Oxford University Press, 2005), E. Savage-Smith, F. R. Maddison, *et al.*, *Science, tools & magic*, 2 vols (Oxford University Press, 1997), and J. W. Allan and B. J. J. Gilmour, *Persian steel. The Tanavoli collection* (Oxford University Press, 2000). With regard to work in progress, the article by Emilie Savage-Smith and Jeremy Johns, 'The Book of Curiosities: a newly discovered series of Islamic maps', *Imago mundi*, 55 (2003), 7–24, is a preliminary study of an important manuscript, now in Oxford, that is currently being edited and translated by a team headed by Savage-Smith. Another major ongoing project is the editing and translation, by Zimmermann, of the treatise by al-Razi, 'Doubts about Galen'.

33 The integration of Oxford's historians of mathematics in the wider community is reflected in the collective volume, edited by J. Fauvel, R. Flood and R. J. Wilson: *Oxford figures. 800 years of the mathematical sciences* (Oxford University Press, 2000). Stedall's work has become a focus for a developing interest in seventeenth-century mathematics, including the work of Thomas Harriot, which also continues to be explored in the annual Thomas Harriot lectures at Oriel College (see note 36 below). Among works already published, see Stedall's *A discourse concerning algebra. English algebra to 1685* (Oxford University Press, 2002), *The greate invention of algebra. Thomas Harriot's treatise on equations* (Oxford University Press, 2003), *The arithmetic of infinitesimals. John Wallis 1656, translated from Latin to English with an introduction by Jacqueline A. Stedall* (Springer, New York, 2004), and (with Noel Malcolm) *John Pell (1611–1685) and his correspondence with Sir Charles Cavendish. The mental world of an early modern mathematician* (Oxford University Press, 2005).

34 All three hold the position of senior research associate in the Museum of the History of Science, as does Robert Anderson, formerly director of the British Museum and now resident in Cambridge but a regular visitor to Oxford. Heilbron was professor and, for some years, vice-chancellor in the University of California at Berkeley. North went on to a chair at the University of Groningen after taking his DPhil in Oxford, for a thesis that was the foundation of his

The measure of the universe. A history of modern cosmology (Clarendon Press, Oxford, 1965), and holding the position of assistant curator in the Museum of the History of Science. Turner served for many years as assistant curator, later senior assistant curator, in the museum, before moving to Imperial College, London, where he held a visiting professorship in the history of scientific instruments from 1988 to 1998. For examples of recent books published by the Oxford-based senior research associates, see J. L. Heilbron, *The sun in the church. Cathedrals as solar observatories* (Harvard University Press, Cambridge, MA, and London, 1999), J. D. North, *God's clockmaker. Richard of Wallingford and the invention of time* (Hambledon & London, London, 2005), and G. L'E. Turner, *Renaissance astrolabes and their makers* (Ashgate, Aldershot, 2003).

35 J. A. Bennett and S. Mandelbrote (eds), *The garden, the ark, the tower, the temple. Biblical metaphors of knowledge in early modern Europe* (Museum of the History of Science in association with the Bodleian Library, Oxford, 1998). This volume grew from an exhibition organized jointly by the Museum of the History of Science and the Bodleian Library in 1998. The exhibition (of which an online version is available on the museum's website; see note 27) was accompanied by a series of research seminars and public lectures.

36 R. Fox (ed.), *Thomas Harriot. An Elizabethan man of science* (Ashgate, Aldershot, 2000). This volume contains revised versions of the first 10 of the annual Thomas Harriot Lectures, inaugurated in Oriel College in 1990 and organized since then by Robert Fox.

37 The relations between the James Martin Institute (JMI) and the newly established James Martin 21st Century School have yet to be clarified. But the JMI is currently seen as one of a number of Oxford-based institutes associated with, and working in collaboration with, the school (see http://www.21school.ox.ac.uk).