

Introduction

The published, public book or paper is no longer the only material of interest to historians of science and medicine. Correspondence, diaries, laboratory notebooks, clinical records and a range of other sources are now appreciated as providing valuable insights into the production, dissemination and use of scientific and medical knowledge. Several large correspondence projects testify to the place that letters occupy in contemporary historical thinking. For the Victorian era, the correspondences of Charles Darwin and Michael Faraday are the most visible examples, and those of Henry Oldenburg and Isaac Newton have illuminated the period of the early Royal Society.¹

Victorians used letters like we use the telephone and emails: to communicate whenever they needed to. The postal service was more efficient then, with several deliveries each day, and after the railways were in full swing, often a speedier transport between cities. Consequently, individuals wrote notes and letters to communicate mundane matters, like luncheon times, greetings to the family, or the possibility of meeting. Victorians also used the postal service to talk about more serious matters, such as the books they were writing, politics, or what decisions they ought to take about substantial issues. Darwin is a particularly good example of the enabling function of a decent postal system, since he rarely left Down House and used his extensive network of correspondents as a lifeline to the wider scientific world.

Thomas Henry Huxley and Michael Foster also participated in this epistolary way of life, and the correspondence reproduced here records their friendship lasting more than three decades. Despite a few obvious gaps, the surviving correspondence has a wonderful dynamic, as the two colleagues age and mature, their interests change and their relationship develops. Read straight through, the letters offer a window into the Victorian values of two major life scientists of the period.

Huxley before Foster

T. H. Huxley (1825–95) is much better known than his friend Michael Foster. His advocacy of Darwin has ensured his lasting position in the history of science, but he was also a considerable naturalist, palaeontologist and scientific man of letters in his own right.² Born in Ealing, part of Greater London, he came from what we would call a

¹ Frederick Burkhardt and Sydney Smith (eds), *The correspondence of Charles Darwin*, Cambridge and New York, Cambridge University Press, 1985–ongoing (<http://www.darwinproject.ac.uk/>); Frank A. J. L. James (ed.), *The correspondence of Michael Faraday*, London, Institution of Electrical Engineers, 1991–; A. Rupert Hall and Marie Boas Hall (eds), *The correspondence of Henry Oldenburg*, 13 vols, Madison, University of Wisconsin Press, 1965–1986; H. W. Turnbull, *et al.* (eds), *Correspondence of Isaac Newton*, 7 vols, Cambridge, published for the Royal Society at the University Press, 1959–1977.

² Adrian Desmond, *Huxley: from devil's disciple to evolution's high priest*, London, Penguin, 1997; originally published in 2 vols: *Huxley, the devil's disciple*, London, Michael Joseph, 1994; *Huxley: evolution's high priest*, London, Michael Joseph, 1997; Leonard Huxley, *Life and letters of Thomas Henry Huxley*, 2 vols, London, Macmillan, 1900; Cyril Bibby, *Scientist extraordinary: the life and scientific works of Thomas Henry Huxley, 1825–1895*, Oxford and New York, Pergamon Press, 1972.

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dysfunctional family. His father was a mathematics teacher in an Ealing school to which Huxley went for two years. The school folding, the family moved to Coventry in 1835 where Huxley spent his restless teenage years reading about science. In 1839 he was apprenticed to his brother-in-law, a medical practitioner. By 1841 he was back in London's East End, working with another medical practitioner. Later that year, he moved in with another sister, whose husband was also in medical practice, and enrolled in a private anatomy school. In 1842 he obtained a scholarship to the more formal medical school at Charing Cross Hospital, London. He was an adept student and discovered a love of microscopy, which never left him. He published his first scientific paper in 1845,³ and won a gold medal in the University of London's physiology and anatomy exam. However, various scandals in the family affected his financial status, so he joined the navy in 1846.

Huxley always had an anarchic streak in him, so it is not surprising that he did not find naval life congenial. However, his talents were recognised and he secured a post as scientific surgeon naturalist on HMS *Rattlesnake*. It was not quite the gentlemanly status that Darwin had enjoyed on HMS *Beagle*, but the experience served Huxley well. The voyage lasted almost four years, and during it he honed his microscopical skills, found much marine material for research, and, while in Australia, met his future wife, Henrietta (Nettie) Heathorn (1825–1914). He returned an accomplished naturalist, though still unable to support a wife.

Huxley's reputation preceded him back to London, and the scientific community rallied behind his desire to follow a career in science. He managed to get paid leave from the Navy to write up his work on oceanic hydrozoa, and was elected a Fellow of the Royal Society in 1851, fast-tracked to its Council in 1853.⁴ Paid scientific jobs were few and far between in the 1850s, however, and Huxley, unlike Lyell, Darwin and many others of the scientific elite, had no private income.⁵ He published a good deal, and won the Royal Medal from the Royal Society, worth £ 50, but was unable to find a paid job until 1854, when he cobbled together a variety of teaching posts at several London institutions, including the School of Mines, the Geological Survey, the London Institution, and the Department of Science and Art, a government establishment aimed at training teachers.

Huxley added other positions over the years, but his professional life was always a mix of income from multiple sources and obligations to a large number of organisations with which he was associated. He resisted job offers outside London, for him, until his health became a problem, the centre of the universe, and except for a brief stint in Edinburgh and much travel in connexion with his duties in government departments, London was the base of his scientific career.

That career was very successful within the limits of early Victorian science, but *The origin of species* (1859) gave him a larger cause and made him into a public figure. Huxley

³T. H. Huxley, 'On a hitherto undescribed structure in the human hair sheath', *London Medical Gazette*, 1845, 36: 1340–1.

⁴T. H. Huxley, *The oceanic Hydrozoa: a description of the Calycophoridae and Physophoridae observed during the voyage of H.M.S. "Rattlesnake," in the years 1846–1850, with a general introduction*, London, printed for the Ray Society, 1859.

⁵Peter Alter, *The reluctant patron: science and the state in Great Britain, 1850–1920*, transl. Angela Davies, Leamington Spa, Berg, 1986.

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reviewed Darwin's book sympathetically in *The Times* and famously debated evolution in the following June, at the Oxford meeting of the British Association for the Advancement of Science (BAAS, or generally in the correspondence, BA). Huxley's encounter with Samuel Wilberforce, the scientifically literate Bishop of Oxford, has become the stuff of legends, even if the exact details of what happened are blurred, despite the fact that the debate was a public one in a crowded room. The thrust hinged on Wilberforce's facetious question about whether Huxley was descended from apes on his grandmother's or grandfather's side. Huxley replied to the effect that he would rather be descended from an ape than stoop to such rhetorical flourishes in a serious scientific debate.⁶

Huxley had quickly become Darwin's self-appointed bulldog, and he remained close to his master for the rest of Darwin's life. Huxley's relationship to Darwin's actual theories, however, was much more complex. While Darwin turned Huxley into an evolutionist, and a high priest of Scientific Naturalism, Huxley never really accepted the explanatory force of natural selection, and, even more surprisingly, never taught evolutionary doctrine in his formal lectures.⁷ He advocated evolution in many of his public addresses, and even coined the term Darwinism, but his lectures to his students were without much evolutionary content. These lectures occupied a great deal of his time, as the following correspondence documents.⁸

By the time Huxley and Michael Foster began to correspond, in the mid-1860s, Huxley was an established public figure. He had a growing family and had recovered his emotional equilibrium after the death, in 1860, of his son Noel. This affected him much as the loss of Darwin's beloved daughter Annie had cast a pall over Darwin's life.⁹ Grief enters the Huxley–Foster correspondence, too, with the deaths of Foster's wife and a married daughter of Huxley. So frequent was the correspondence that the main concerns of Huxley's life after the mid-1860s can be followed in the correspondence with his friend Foster (and the footnotes that annotate this volume).

Foster before Huxley

Michael Foster (1836–1907), younger than Huxley by eleven years, has become a relatively unknown figure historically, even if he eventually cut a considerable figure in his own lifetime. He followed Huxley as Biological Secretary of the Royal Society, for instance, serving in that post longer (1881–1903) than many of his colleagues thought

⁶There are discussions of the debate in Desmond, *op. cit.*, note 2 above, pp. 278–81, and Janet Browne, *Charles Darwin*, vol. 2, *The power of place*, London, Jonathan Cape, 2002, pp. 120–8.

⁷See Frank Turner, *Between science and religion: the reaction to scientific naturalism in late Victorian England*, New Haven, Yale University Press, 1974, and Bernard Lightman, *Evolutionary naturalism in Victorian Britain: The 'Darwinians' and their critics*, Aldershot, Ashgate, 2009. For Huxley's biological teaching, see Cyril Bibby, *T. H. Huxley: scientist, humanist, and educator*, London, Watts, 1959, and Robert G. B. Reid, 'Thomas Henry Huxley and nineteenth-century biology', in Alan P. Barr (ed.), *Thomas Henry Huxley's place in science and letters*, Athens, GA, University of Georgia Press, 1997, pp. 182–212.

⁸Thomas H. Huxley, *Collected essays*, 9 vols, London, Macmillan, 1893–1894.

⁹Randal Keynes, *Annie's box: Charles Darwin, his daughter and human evolution*, London, Fourth Estate, 2001.

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desirable. Foster also served as president of the British Association. He played a very important role in the development of both the Natural Sciences Tripos and the medical school at Cambridge. Although never Huxley's formal pupil, he clearly saw Huxley as a role model and was ever appreciative of Huxley's influence in getting him his Cambridge post in 1870, a Fellowship at Trinity College and an attached Praelectureship in physiology.

Foster was born in the East Anglian market town of Huntingdon. He was the eldest of ten children, and his father, also Michael, was a general practitioner.¹⁰ His father was also an Evangelical Baptist, a religious stance that the young Foster found hard to accept. He studied at the local grammar school and then at University College London, where he took an arts degree. Cambridge being barred to him for medical studies, he continued at the Medical School at University College, winning several gold medals and coming under the influence of the professor of anatomy and physiology, William Sharpey. Following his graduation (MB, 1858, MD, 1859), he spent two further years studying in Paris.

Like Huxley (and Darwin) Foster undertook a sea voyage, although Foster went as a ship's surgeon, and mostly because he feared that he had developed tuberculosis. This proved to be unfounded, but the voyage honed the further development of his microscopical skills and reinforced his desire for a career in science. Following Huxley's own trajectory, Foster also had difficulty finding scientific employment, so for six years or so he joined his father in general medical practice in Huntingdon. During this period he married his first wife, Georgina Edmonds, by whom he had two children, a son and a daughter. Georgina's death (in 1869) is poignantly recorded in this correspondence (Letters 23 and 24), by which time he had been appointed to the staff at University College (but declared himself willing to throw it all in if he could have his deceased wife by his side again).

The two men's lives had become intertwined by the time of Georgina's death, Foster already acting as Huxley's demonstrator at his course in elementary biology at South Kensington, as well as succeeding Huxley as Fullerian professor of physiology at the Royal Institution. The correspondence documents pretty fully the years of their friendship, although this is truer for Huxley than Foster. Even after he moved to Cambridge in 1870, London was still a very important place for Foster's scientific activities, and the sight of him getting on the early morning train, from Cambridge's long platform, was part of his Cambridge mystique. This correspondence is consequently more about Foster's London life than his Cambridge one, whereas the more expansive Huxley talked about most of his activities in London and, increasingly, abroad in search of health.

Foster was based in Cambridge, however, and he took his commitments there seriously. He pioneered the teaching of physiology and elementary biology, was instrumental in the rise of the Medical School to one of prominence, and developed an internationally acclaimed research school in physiology.¹¹ He attracted talented people to him and imbued

¹⁰The fullest account of Foster's life and career remains the pioneering monograph by Gerald Geison, *Michael Foster and the Cambridge School of Physiology: the scientific enterprise in late Victorian society*, Princeton, Princeton University Press, 1978.

¹¹Geison, *ibid.*, analyses this in some detail. On research schools more generally, see Gerald L. Geison and Frederic L. Holmes (eds), *Research schools: historical reappraisals*, *Osiris*, 2nd ser., 1993: 8.

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them with an enthusiasm for research, even if his own original research was fairly ordinary and done early in his career. Many of his students feature in the correspondence, even if he did not routinely confide in Huxley about the intricacies of scientific politics in Cambridge. Instead, the two men mostly wrote to each other about what they had in common.

Corresponding

Reading this remarkable correspondence straight through is rewarding. Both Huxley and Foster were witty and sensitive letter writers, and their relationship developed naturally, as their professional and personal lives intertwined. Their salutations changed with moods or as epistolary matters emerged. Although they never greeted each other by their Christian names (their occasional use of first names in referring to other people is interesting), sometimes the salutation is 'Dearly Beloved'. They wrote with affection and humour about the emotional ups and downs of daily life. Mostly, however, Huxley and Foster wrote about business, and their careers intersected on several fronts, on which four main themes emerge.

Teaching

Huxley and Foster were both eminent professional scientists, officers in the Royal Society and actively involved in the running of British science. It is sobering to note how much of their daily lives was taken up with the grind of elementary biology teaching and examining. Foster assisted Huxley with a popular summer course for science teachers at South Kensington. The numbers involved were very large and both the setting up of demonstrations and the appointment of assistant examiners occupies a large bulk of their correspondence, especially in the early years. The course had to be taught, the examinations set and approved and the scripts had to be marked. The correspondence reveals relatively little of the content of their courses and is more revealing of their administration than of the nuances of lectures and demonstrations. Both of them appreciated the money they received (real but modest) but the work involved was also very demanding and time-consuming. They shared the belief that such elementary teaching was important, as a first step in creating a scientifically literate society. The two men also discuss the reform of the science curriculum in the British universities, and the relative importance in British higher education of classics and science. Foster confessed early on that his main scientific talent was in teaching (Letter 5), and he exploited this talent to its fullest extent, both in collaboration with Huxley and at Cambridge. His most substantial publication was his textbook of physiology, which went through multiple editions and was admirable in reporting the latest research, thereby encouraging his students to value physiological work. His own research output was modest; he was an orchestra conductor but did not spend much time himself playing an instrument. He and one of his students also collaborated with Huxley in textbook production, and a regular trope was the production of later editions, and the credit to be assigned to each collaborator. For his part, after his health became a dominant issue in his life, Huxley seems to have withdrawn from the minutiae of revision, but could become irritable when he felt the shares were being inequitably distributed. Foster was always tactful.

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Scientific Politics

Since both men were at the centre of Victorian scientific culture, it is unsurprising that much of their correspondence touches on topics of the day. Huxley's own reluctant, brief and not entirely successful presidency (1883–85) of the Royal Society occupies a large tranche of the correspondence during the mid 1880s.¹² Foster was ever supportive, even when Huxley found it necessary to spend a good time of those years abroad. He duly reported back what was going on, and seemed to act as his on-site lieutenant. During G. G. Stokes's presidency (1885–90), the relationship between science and real politics reared its head, as Stokes became a Member of Parliament for Cambridge (see letters of November 1887), much to the annoyance of Huxley and to a lesser extent, Foster (after Huxley's death, Foster himself also served as MP for Cambridge, while he was still an officer of the Royal Society). Beyond the presidency, the two men discussed the make-up of Council and other officers, the foibles of the clerks, the desirability of smoking evenings and the nuances of refereeing papers for *Philosophical Transactions*.

Beyond the Royal Society, the correspondence contains much on the jockeying for chairs and other posts in the British universities, the sterling qualities and tragic death of Foster's student Francis Balfour (1851–82) (Letter 105), and, throughout, the character of the mercurial and erratic but clever and productive biologist Edwin Ray Lankester (1847–1929). No person in their correspondence is so minutely analysed as Lankester, who clearly infuriated Huxley. As ever, Foster was more circumspect, and even Huxley appreciated Lankester's scientific qualities. These were not enough to make it suitable for Huxley to support his membership in the Athenaeum, the club of clubs, where Foster and Huxley sometimes met for chat and dinner (Letter 188).¹³

Many other individuals feature in this correspondence, the great and the forgotten. Huxley's and Foster's firm convictions and principles shine through, as both men sought to influence the development of the life sciences in Britain. Each of them was well placed to do so, with the consequence that their letters offer a wonderful insight into their world.

Committee Work

Huxley and Foster found themselves on numerous common committees, and, although they occasionally complained, both were conscientious committee men. A good deal of their correspondence dealt either with advanced preparations for meetings, or discussed outcomes and how they might be further influenced. Occasionally they found themselves on ad hoc committees, convened for particular purposes. They also sat on three standing committees that occupied a good deal of their time (and the correspondence). These were the Government Grant Committee, administered through the Royal Society; the Marine Biological Association (MBA) Committee; and the *Challenger* Committee.

¹²In addition to the discussion by Desmond and other biographers of this episode in Huxley's life, see Marie Boas Hall, *All scientists now: the Royal Society in the nineteenth century*, Cambridge and New York, Cambridge University Press, 1984.

¹³The only full-length biography of Lankester – Joseph Lester, *E. Ray Lankester and the making of modern British biology*, ed. Peter J. Bowler, Faringdon, Oxon, British Society for the History of Science, 1995 – is helpful but clearly not the last word on this important but shadowy biologist.

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What Foster and Huxley called the Government Grant Committee had been set up in 1849. It was a breakthrough in the role of the State in the funding of scientific research in Britain. Although the initial grant was only £1000 per annum, it increased to £5000 in 1876, after the publication of the Devonshire Commission's Report. The grant's relationship to the Royal Society meant that many of the successful applicants were fellows, although it was never confined to this group.¹⁴ The percentage of awards to Fellows declined from 87.5 per cent in the 1850s to 57.9 per cent in the 1890s. The sums seem small by modern standards (more than half were for less than £50), even when translated to current buying power, but the symbolic value, as evidence that the State took scientific research seriously, was much larger. A number of the letters, during the years when both Huxley and Foster sat on the Committee, concern issues related to applications and the politics of giving grants. They clearly took their responsibilities seriously.

The establishment of the Marine Biological Station in Plymouth in 1888 also directly impinged on the two men's lives, especially because Ray Lankester was intimately involved in it. A similar station in Naples and its founder Anton Dohrn (1840–1909), German born but spending his scientific life in Italy, features regularly throughout the correspondence. Dohrn had good contacts with British science and received a bit of early support from the Royal Society. Foster regularly sent his students to Naples for study, and Huxley's long-time association with the Fisheries Commission in Britain meant that both men were very committed to the importance of applying scientific methods to studying the sea and its creatures.¹⁵

The Marine Biological Station and its parent organisation, the Marine Biological Association, occupied much time for both Foster and Huxley during Huxley's last decade. The MBA shared with the Government Grant the positive aspect of State support for science; as always, they took their committee work seriously; and, as always, when Lankester was involved, there was much tension, both with appointments he wished to make and his own ideas about how the Station should evolve. The correspondence provides much behind the scenes material of the early years of the MBA and, as with all the committees in which the two men were mutually involved, reminds us how different the public and private records of institutions are.¹⁶

The sea was also central to the third major committee that Huxley and Foster sat upon: that of the *Challenger* expedition. Unlike the MBA, which remains relatively unexplored

¹⁴In addition to Alter and Hall, see especially the essays of Roy MacLeod, collected into two Variorum editions, *Public science and public policy in Victorian England*, Brookfield, VT, Variorum, 1995 and *The "creed of science" in Victorian England*, Aldershot, and Burlington, VT, Ashgate / Variorum, 2000. See also Roy M MacLeod, 'The Royal Society and the government grant: notes on the administration of scientific research, 1849–1914', *Historical Journal*, 1971, **14**: 323–58.

¹⁵For Dohrn, see Theodor Heuss, *Anton Dohrn: a life for science*, transl. Liselotte Dieckmann, ed. Christiane Groeben, Berlin and New York, Springer, 1991; also published volumes of correspondence such as Christiane Groeben (ed.), *Charles Darwin 1809–1882, Anton Dohrn 1840–1909: correspondence*, Naples, Macchiaroli, 1982; and Christiane Groeben (ed.), *Correspondence, Karl Ernst von Baer (1792–1876), Anton Dohrn (1840–1909)*, transl. Christiane Groeben and Jane M. Oppenheimer, Philadelphia, American Philosophical Society, 1993.

¹⁶The literature on the Marine Biological Association is relatively sparse, but see A. J. Southward and E. K. Roberts, *The Marine Biological Association, 1884–1984: one hundred years of marine research*, Plymouth, Marine Biological Association, 1984, and Joseph Lester, *E. Ray Lankester and the making of modern British biology*, ed. Peter J. Bowler, Faringdon, Oxon, British Society for the History of Science, 1995.

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historically, the *Challenger* voyage has attracted a good deal of comment. To be sure, it was extremely important in the history of marine biology, and its findings could be said to have laid the foundations of the discipline. Both the State and the Royal Society were involved in its funding and administration, and both Foster and Huxley would have had warm associations with voyages of exploration. Unlike the voyages that Huxley, Foster, or Charles Darwin participated in, the *Challenger* was devoted exclusively to science.¹⁷

The *Challenger* left Portsmouth in December 1872, returning after more than 68,000 miles in May 1876. It touched many places where the *Beagle* had landed, and its “Darwin” was Henry Moseley (1844–1891), whose published account of the voyage is still held in regard. He was well known to both Foster and Huxley who mourned his premature death. They also both knew John Murray (1841–1914), the Canadian-born naturalist who oversaw the writing and publication of fifty volumes of the voyage’s findings. Both these men, along with several others involved in the enterprise, make their appearances in this correspondence.

The size of the published findings reinforces the voyage’s importance, but one particular discovery had special meaning for Huxley. Ernst Haeckel had suggested that the ocean floor was covered with a primordial slime (protoplasm, perhaps?) that Huxley had espoused. Named *Bathybius haeckelii*, this primitive substance was shown from *Challenger* dredgings to be an inorganic precipitate (Letters 86 and 87). Huxley accepted the findings with grace and humour: “*Bathybius* has not filled the promise of its youth”, he wryly wrote.¹⁸ Huxley had earlier memorably quipped, “The great tragedy of Science – the slaying of a beautiful hypothesis by an ugly fact”. When his turn came, he accepted it in good grace, recanted and continued to attend meetings of the *Challenger* Committee as often as his health would permit.

Health and Domesticity

As prominent members of the community espousing scientific naturalism, both Huxley and Foster were vulnerable to the assumption that naturalism was an excuse for libertinism. We know that Huxley was especially conscious that his morals – personal as well as professional – were under scrutiny from individuals who would pounce on any infelicity and attribute it to his agnosticism (he coined the word, of course). Foster, reared as an evangelical Baptist but refusing to follow its doctrines, would have been aware of the same pressures, especially as antivivisection sentiment increased. In fact, both men seemed to have found it easy to be faithful husbands, loving fathers, and conscientious members of society. They grieved over the deaths of loved ones and close friends, reported their holidays, enjoyed the successes of their children, and had wonderfully developed Victorian notions of duty. As their own friendship grew, the correspondence acquired a rich domestic dimension, even though they never forgot the common scientific concerns they shared.

¹⁷ Margaret Deacon, *Scientists and the sea, 1650–1900*, 2nd ed., Aldershot, Ashgate, 1997.

¹⁸ See Philip F. Rehbock, ‘Huxley, Haeckel, and the oceanographers: the case of *Bathybius haeckelii*’, *Isis*, 1975, 66: 504–33, and Desmond, op. cit., note 2 above, p. 460.

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Whereas Darwin's illnesses have been minutely analysed by historians, Huxley's had an equal impact on his last couple of decades. His letters read like those of a quintessential Victorian valetudinarian. Sometimes his native wit came through, and he was in turn frustrated and bemused by the fact that his body no longer responded like it had in his youth. Latterly he hated going to his beloved London, and increasingly spent months each year in Italy or other warmer climates, reporting the almost daily variations of energy or feeling of well-being. Eventually he stayed in England, complaining to Foster about the winds, cold or the presence of influenza in the neighbourhood (or household). Like Darwin, however, Huxley continued to be active intellectually even during his final years, engaging especially in the kinds of polemical battles that he loved so well. The correspondence reports these in detail. We can also follow minutely the health concerns of Huxley's wife, since his obsession with his own health never affected his protectiveness for Henrietta.

Like Huxley, Foster lived to the Biblical three-score and ten, but he was the younger man and his health reports were much shorter and less frequent. As always, he took the more supportive, passive role in their relationship, fitting easily into the role of Huxley's lieutenant. But they were also friends and equals, and this correspondence is above all a testament of friendship.