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Thomas Young (1773–1829)

by Charles Turner, pubd 1830 (after Sir Thomas Lawrence, after 1820)

Young, Thomas (1773–1829), physician and natural philosopher, was born on 13 June 1773 at Milverton, Somerset, the eldest of ten children of Thomas Young, cloth merchant and banker, and his wife, Sarah, daughter of Robert Davis of Minehead, Somerset, and his wife, Hannah Brocklesby. Both parents were active and strict members of the Society of Friends who impressed Quaker values on their son.

Education

Young's early years were spent at the home of his maternal grandfather, who encouraged his education and introduced him to classical literature. After a short stay at a 'miserable boarding-school' (Peacock, 4) he moved in 1782 to a school in Compton Abbas, Dorset—presumably a Friends' school—run by a Mr Thompson. There he studied Latin, Greek, mathematics, and natural philosophy, and one of the ushers also taught him various mechanical skills. Although Young's formal schooling lasted some six years it is clear that he was partially, if not largely, self-taught. Leaving the school in 1787 he joined the household of the Quaker banker David Barclay at Youngsbury, Hertfordshire. Here Young became the tutor and companion to Barclay's grandson Hudson Gurney, who was only two years his junior. They were later joined at Youngsbury by John Hodgkin, a Quaker tutor who was likewise an accomplished classical scholar.

With the encouragement of his mother's uncle Dr Richard Brocklesby, who had tended him during an extended illness, Young decided to pursue the career of a physician. Moving to London he attended the medical school founded by William Hunter and, in 1793, entered St Bartholomew's Hospital. During this period he attended lectures delivered by many of the key men on the London medical circuit including John Hunter, William Cumberland Cruikshank, James Edward Smith, and Matthew Baillie. In 1794 he also attended chemical lectures at the home of Bryan Higgins and gained some familiarity with experimental techniques that Higgins encouraged in his students. Moreover, through Brocklesby the young Quaker was introduced to many of the leading lights of London society. With his developing interest in science and his eye on a successful medical career he was drawn towards the Royal Society of London. Before his twentieth birthday he presented his first paper to the society and was elected in June 1794, his election being supported by Brocklesby and fifteen others including several medical men of high standing.

Young has sometimes been hailed as a child prodigy who, by the age of sixteen, had not only mastered Latin and Greek but also possessed a good working knowledge of several other languages and gained a firm background in the sciences. He clearly possessed considerable mental abilities, while his Quaker upbringing encouraged the habit of hard work and proscribed frivolous activities. So effective was his training that later in life he claimed never to have wasted a single day. While his academic interests were also encouraged by his parents and teachers they would not have supported his growing enthusiasm for both music and dancing. Membership of the Quaker community also stood in the way of his career. In the heady life of London the socially ambitious Young cast off the distinctive dress and modes of address accepted by his parents. When he moved to Edinburgh in October 1794 a certificate slowly followed from the Westminster monthly meeting passing responsibility to the Edinburgh Friends, and another certificate was subsequently issued by the Edinburgh monthly meeting after he left the city. However, Young had probably forsaken many of his parents' religious principles by the time he arrived in Edinburgh. Quaker bureaucracy appears not to have been particularly efficient since it was only in February 1798 that he was formally disowned. The appropriate minute noted that Young had 'attended places of public diversion' (RS Friends, Lond., Dictionary of Quaker biography). Indeed by the time he arrived in Edinburgh, if not before, he frequented the theatre and took lessons in dancing and playing the flute. When interviewed by a deputation from the Westminster meeting-house he evinced no remorse about his conduct, but 'by his own acknowledgement [was] estranged from us in principle and practice'. He subsequently became a member of the Church of England.

Two other events deserve notice. The death of Young's kinsman Richard Brocklesby in 1797 provided him with a comfortable living. He inherited Brocklesby's London house, his library, pictures, and a sum of £10,000. Additional income was subsequently derived from his medical practice, his various scientific, medical, and civic appointments, and from his numerous literary ventures. One further source of income was the £500 per annum he received between 1824 and 1829 from the Palladian Insurance Company as its physician and inspector of calculations. The second event was his marriage on 14 June 1804 to Eliza (1785–1859), second daughter of James Primrose Maxwell, who was related to the aristocratic Maxwells of Calderwood. Through this marriage, which was childless, Young further strengthened his position within the London establishment.

Meanwhile, between 1794 and 1799, Young's pursuit of a medical education had taken him to universities in three countries. The medical school at Edinburgh was still in its heyday and attracted large numbers of students, including many from dissenting backgrounds. Here he attended lectures spanning materia medica (Francis Home), chemistry (Joseph Black), and anatomy and surgery (Alexander Monro secundus). Although Young recognized the quality of medical education in Edinburgh his comments on his lecturers were less than generous. Yet he continued his classical studies, was a voracious reader, and improved his dancing and flute playing. After touring Scotland in the summer of 1795 he enrolled at the University of Göttingen, which he appears to have found more intellectually challenging than Edinburgh. Not only did he attend lectures on various branches of medicine but also on history and natural philosophy. He even found time for twice-weekly lessons in drawing, riding, dancing, and playing the clavichord. Before he departed from Göttingen he submitted his dissertation, entitled 'De corporis humani viribus conservatricibus', and graduated doctor of physic in July 1796.

A London practice

It is not clear why Young subsequently decided to continue his education at Cambridge. Regulations relating to the admission of fellows of the Royal College of Physicians had recently changed and Young, having spent but one year at

both Edinburgh and Göttingen, may not have been eligible for a fellowship. He may therefore have decided to seek a Cambridge degree. Having passed six terms in residence at Emmanuel College (1797–9), he gained his MB in 1803. However, he appears to have spent as much time as possible in London. Setting up practice in Welbeck Street as soon as he left Cambridge, Young tried to make a name for himself in affluent London circles. Despite his dedication to medicine, his practice developed slowly. In 1808 he obtained his MD from Cambridge, the earliest date under the university's regulations.

During the next few years Young's career progressed rapidly. In 1808 he also obtained the coveted fellowship of the Royal College of Physicians and delivered the Croonian lecture, entitled 'The function of the heart and arteries' at the Royal Society. In 1810–11 he delivered two courses of medical lectures at the Middlesex Hospital. Then, early in 1811, he was appointed physician at St George's Hospital, a position he held until his death. As well as his hospital practice and his private one, he spent most summers in Worthing where he tended his patients on their vacations. Young was probably reasonably effective as a physician but he did not possess a congenial bedside manner and experienced difficulty in attracting patients. By temperament he was more inclined to literary and scientific studies than to being a practising physician. It is perhaps fitting that one of his main contributions to medicine was his carefully compiled *Introduction to Medical Literature* (1813; second edition, 1823) in which he provided a detailed taxonomy of diseases. In both 1813 and 1823 he served as one of the censors of the Royal College of Physicians, where he delivered an endowed Croonian lecture in 1822–3.

Optics

Although Young's medical career started slowly it enabled him to devote a considerable amount of time to studying various scientific subjects. While still a student in London he read to the Royal Society a paper postulating that the eye's ability to accommodate to objects at various distances was due to the deformation of its crystalline lens. This conclusion was subsequently supported in his more carefully argued Bakerian lecture for 1800, entitled 'The mechanism of the eye'. The propagation of sound provided another early research topic. Although he first engaged with the subject in his Göttingen dissertation, he subsequently developed it in a series of papers in which he sought to account for various acoustical phenomena in terms of the vibration of particles composing the medium of transmission. In particular, he explained 'beats' as resulting from the mechanical effect of two vibrations. His main contribution to this topic, which was read before the Royal Society in January 1800, contained a concluding section in which he explored the analogy between sound and light. Here we find his initial attempt to articulate a wave theory of light on the assumption that light is also a vibratory motion; for Young, light was a longitudinal vibration of particles composing a ubiquitous ether.

Young's immersion in physical optics must be related to an important two-year diversion to his career. The Royal Institution, which had been founded by Count Rumford and others in 1799, appointed him to its professorship of natural philosophy in July 1801. With a salary of £300 and rooms at the institution he became superintendent of the house and editor of its journals. Yet the most challenging aspect of his appointment was the preparation of an extensive course on natural philosophy which he delivered on two occasions; fifty lectures in 1802 and sixty in 1803. His lectures were not very well received since he pitched their content far above the capabilities of his audience. However, in preparing these courses, which covered mechanics, hydrodynamics, astronomy, and physics, he was forced to analyse critically a wide range of topics and in many areas he made small but significant innovations. The lectures were subsequently published as *A Course of Lectures on Natural Philosophy and the Mechanical Arts* (2 vols., 1807; revised by P. Kelland, 2 vols., 1845), and were dedicated to Thomas Grenville. Here, for example, we find the definition of the modulus of elasticity that has become associated with Young's name. One major theme linking several of these lectures was his attempt to construct a unified natural philosophy based on a ubiquitous ether. In this he developed some of the queries added to the 1717 edition of Newton's *Opticks*. However, in contrast to Newton he suggested that ether was attracted to gross bodies so as to form atmospheres around them. Although somewhat successful in explaining thermal, electrical, magnetic, and optical phenomena by this ether density hypothesis, he soon abandoned it, and it did not appear in the published version of his lectures.

The majority of Young's contemporaries followed Newton in accepting that light consists of small particles emitted from luminous sources at high speeds and in rejecting all theories that attributed light to a vibration in the ubiquitous ether. As noted above, in his acoustical paper of 1800 Young explored the analogy between light and sound and here he followed Leonhard Euler in propounding a vibratory theory in which the perceived colour of light depends on the frequency of the vibrating ether, such that the longest wavelengths correspond to the red end of the visible spectrum. Here he also attempted to show that the standard arguments against wave theories carried little weight. In November 1801 he presented to the Royal Society a more sustained defence of wave optics. In this Bakerian lecture entitled 'On the theory of light and colours' he sought to extend the theory's explanatory power by integrating it with his ether density hypothesis. One significant innovation was the application to optics of the principle of interference which he had developed in his work on acoustics. He envisaged two nearly parallel light rays meeting so that the ether particle at that point would undertake a combination of the two vibratory motions; depending on the phase relationship, this might result in either constructive or destructive interference. In this and two subsequent publications he showed how this two-ray account of interference could explain such phenomena as the colours of thin plates and those seen when a fibre is held close to the eye. Only in the published *Lectures* of 1807 did he apply his principle of interference to the two-slit experiment which has become associated with his name.

Young's early attempts at framing a wave theory suffered from internal contradictions. Few took either his theory or his notion of interference seriously, and we have to wait a decade and a half for Augustin Fresnel's far more complete and mathematically sophisticated articulation of wave interference which helped to convince many of the superiority of a wave theory of light. In the meantime Young made several minor contributions to the explanation of polarization and double refraction that Étienne Malus, David Brewster, François Arago, and Fresnel were rapidly developing. In 1817 Young sought to extend the scope of the wave theory by suggesting that polarization might be explained on the assumption that light is a transverse vibration of the ether particles. In contrast to Fresnel's far more incisive pronouncements on this issue Young remained rather uncertain and even pointed out in 1823 the awkward implication that transverse vibrations required the luminiferous ether to be 'not only highly elastic, but [also] absolutely solid!!!' (*Works of Thomas Young*, 1855, 1.415)

In his 1801 Bakerian lecture Young also laid the basis of his theory of colour sensation. In rejecting the view, often attributed to Newton, that each ray of light corresponded to one of seven distinct spectral colours, Young conceived the visible spectrum as continuous. Moreover, a continuous spectrum seemed also to undermine the theory that required each point on the retina to contain a vast number of receptors, each tuned to a different frequency. Instead he proposed that colour vision could be explained if there were just three types of receptor, according to the three principal colours—red, yellow, and blue. He subsequently modified this theory in his published *Lectures* and in his 1817 article on 'Chromatics'. In his mature theory he postulated just three types of receptor, corresponding to the colours red, green, and violet. He claimed that this was the simplest theory and that any intermediate frequency, or colour, of light would affect more than one receptor. Thus yellow light would affect equally the green and red receptors, while white light would have an equal effect on all three. Hermann von Helmholtz subsequently rediscovered the three-colour theory, which is now generally known as the Young–Helmholtz theory.

Although Young is often remembered for advancing theories especially in optics, it should be remembered that much of his literary output was far less innovative. As a man of considerable erudition and an inveterate reader and writer, Young participated in many literary ventures, contributing at various times and on a variety of subjects, to the *Gentleman's Magazine*, the *British Magazine*, the *Imperial Magazine*, the *Journal of the Royal Institution*, the *Quarterly Review*, Brande's *Philosophical Review*, and the *Nautical Almanac* (which he edited from 1818). He also contributed over sixty anonymous articles to a supplement of the *Encyclopaedia Britannica* edited by Mcvey Napier. Many of these were biographies—including those of Richard Porson and Lagrange—but others dealt with technological and scientific subjects. Although some of these articles were highly derivative, others show Young's ability to draw out and develop his own understanding of a complex subject. Perhaps the most innovative were his articles on 'Egypt', 'Tides', and 'Chromatics'.

Royal Society activities

Young played an active role in the affairs of the Royal Society, being its foreign secretary for a quarter of a century beginning in 1804 and a regular attender at council meetings. For much of this time he served under the presidency of Joseph Banks and he readily identified with Banks's vision of the society as a club for gentlemen interested in science. Satisfied with the current system of patronage he was generally viewed as a reactionary who rejected any interference by the government and manifested no sympathy for the increasingly vocal group of fellows who sought to reform the society along meritocratic lines. On several occasions he travelled on the continent, where he met such leading savants as Laplace, Arago, and Humboldt. In 1827 he was honoured by being elected one of the eight foreign members of the Paris Académie des Sciences.

Young's extensive network of connections through the Royal Society enabled him to play a significant role on several committees charged with pursuing investigations into matters of civic concern. In 1814 he became a member of a committee charged with investigating the risk of introducing gas light in London. Two years later he was appointed secretary of the commission charged with ascertaining the length of the seconds pendulum; subsequently he became secretary to a parliamentary commission on the subject. His involvement with the Admiralty was even more extensive. He examined new methods of ship construction and submitted a report to the Royal Society in 1814 which was generally deemed too theoretical to be of practical use.

Four years later Young was appointed superintendent of the *Nautical Almanac* and secretary of the board of longitude. These two positions were among the few salaried scientific posts in England, and from them he received £400 per annum. However, his work for the Admiralty also led to controversy with a number of astronomers, especially Francis Baily and James South, who considered that under Young's direction the *Almanac* was overzealous in satisfying the needs of navigators to the neglect of its traditional astronomical functions. Moreover, his critics charged that the *Almanac* contained a significant number of errors. Partly in response to such criticism the Admiralty disbanded the board of longitude in 1828 and replaced it by a scientific advisory committee to which Michael Faraday, Edward Sabine, and Young were appointed.

Egyptology

Having shown an early and prodigious interest in languages Young's attention was drawn to the Rosetta stone and to the initial attempts made to decipher both the demotic and the hieroglyphic inscriptions. His first communication on this subject was presented to the Society of Antiquaries in 1814 and over the next few years he published several pieces on the subject, including an article on 'Egypt' that appeared in an 1819 supplement to the *Encyclopaedia Britannica*. Young proceeded on the assumption that the demotic, hieroglyphic, and Greek inscriptions on the Rosetta stone were rough inter-translations and that some of the demotic characters had been derived from the hieroglyphic. Further evidence was gleaned from other Egyptian texts that he was able to consult. Personal names offered a particularly fruitful line for initial investigation. He assumed that each pictorial character possessed a phonetic value such that the hieroglyphs within each cartouche contained such names as Ptolemaios and Birenike. In his article on 'Egypt' he was able to identify approximately 200 separate hieroglyphic signs and at the time of his death was completing his 'Rudiments of an Egyptian dictionary in the ancient enchorial character' which subsequently appeared as an appendix to Henry Tattam's *A Compendious Grammar of the Egyptian Language* (1830). Young's contributions to the study of ancient Egyptian languages have sometimes been compared unfavourably with those of Jean François Champollion. Although his interventions were perhaps less intense than Champollion's he made a number of original and insightful innovations, especially in the mid-1810s.

Although Young was raised in a dissenting household he subsequently sought to set aside the Quakerism of his childhood and to align himself with the religious, scientific, and medical establishment. In this he was largely successful. Given to caution he was increasingly viewed as a conservative. Living in a period when the social élite was under attack both at home and abroad, Young never wavered in his defence of the *status quo* and he remained mindful of his position as an English gentleman. Socially he mixed with other gentlemen of the scientific and medical élite. Although he was widely admired for his knowledge and intellectual achievements most of his acquaintances found him rather stiff and experienced difficulty in establishing close friendships. He was certainly highly intelligent but he appears to have lacked the discipline and insight necessary to pursue topics in great depth. He was most comfortable writing on subjects where he could organize the views of others in original ways.

After visiting Geneva in 1828 Young's health began to fail. Progressive heart disease slowed him considerably, as with increasing difficulty he sought to complete his Egyptian dictionary. On 10 May 1829 he died at his home in Park Square, London, and six days later he was buried in his wife's family vault at Farnborough, Kent. Subsequently his widow pressed for a more public recognition of her husband's achievements; these were celebrated on a plaque erected in Westminster Abbey, close to the spot where Newton was buried.

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- F. Chantrey, medallion portrait on memorial tablet, Westminster Abbey
- F. J. Skill, J. Gilbert, W. Walker, and E. Walker, group portrait, pencil and wash (*Men of science living in 1807–08*), NPG
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