Special Article

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SYDENHAM, WILLIS, LOCKE, AND LOWER

BY

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The main achievements of these Oxford contemporaries are too well known to warrant further repetition. They have all gained eponymous immortality: the circle of Willis,

Thomas Willis (1621-75), from a portrait by Vertue engraved by Knapton.

Thomas Sydenham (1624-1689), from a portrait by Mary Beale. Reproduced from the first edition of *Observationes Medicae* (1676) by kind permission of Bodley's Librarian.

was an orthodox Anglican. During the Interregnum Willis worshipped in a private chapel at his Merton Street home, Beam Hall, which became the meeting-place of former Royalists.

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Sydenham's chorea, the tubercle of Lower, and Locke's disease, or onychogryphosis, first described by the physician-philosopher in 1697.¹ My purpose is to trace some overlapping aspects of their careers which have recently come to light. I would also like to outline their differences of opinion; and to show how civil war and its bitter political aftermath affected all their lives.

Willis and Sydenham at Oxford

Willis and Sydenham came together in the unsettled Oxford immediately after the Civil War, in which they had served in opposing armies: Willis with the Royalist University legion, and Sydenham as a Parliamentary cavalry officer. They had both lost close relatives in the struggle. Willis's father died of camp fever during the siege of Oxford, and Sydenham's mother and brother were killed by Royalists; he himself had been wounded and his father imprisoned. Religious differences also divided them. The Sydenhams were devout Puritans, whereas Willis

Their attitudes to Oxford medicine also differed widely. A contemporary student described Sydenham as being "idle and never study'd"²; his Latin had become rusty, and on his return to Oxford he set about reviving it. Within one academic year he was "created" bachelor of medicine, and immediately afterwards "thrust" into a fellowship at All Souls in place of an unyielding Royalist. His medical degrees and university appointments should therefore be regarded as belated military honours rather than academic distinctions. Sydenham regarded the quaint combination of anatomical dissections and mediaeval disputations which made up the Oxford medical course as being of no value in training a physician for his true role of treating the sick. And he voiced his contempt for the antiquated curriculum to a contemporary medical student, John Ward³: "Physick, says Sydenham, is not to be learned by going to the Universities, but hee is for taking apprentices; and says one had as good send a man to Oxford to learn shoemaking as practising physick."

Willis, on the other hand, had the highest regard for Oxford and its traditions: it took the Archbishop of Canterbury to persuade him to leave for a more lucrative practice in London. Willis worked hard at medicine, and during the lean years of the Commonwealth "every Monday kept Abingdon market."⁴ He was one of the dozen men (four of them physicians) who met regularly to discuss aspects of natural philosophy and to plan experiments. This group eventually formed the nucleus of the Royal Society, of which Willis was one of the original Fellows. He also assisted Dr. William Petty, Tomlins Reader in Anatomy. Together they revived Anne Green after she had been hanged, declared dead by the Sheriff, and her body handed over to the Anatomy School for dissection. Her macabre deliverance was celebrated in undergraduate doggerel⁵:

Anne Green was a slippery queen.

In vain did the jury detect her—

She cheated Jack Ketch and then the vile wretch

'Scaped the knife of the learned dissector.

This sensational incident probably brought Willis and Sydenham together. But shortly afterwards Sydenham left Oxford to serve as a captain of horse in Cromwell's army which opposed the Scottish landing of Prince Charles. In this campaign his younger brother was killed at Stirling, and he was again wounded, probably at the Battle of Worcester.

Locke and Lower at Oxford

Meanwhile Locke and Lower, who had been together at Westminster School, came up to Christ Church. It was Lower who first kindled Locke's interest in medicine, as is evident from entries in the latter's first medical notebook,⁶ begun in 1652. One joint entry on facilitating the clotting of blood is not far removed from the fairly recent remedy of applying the white of an egg. "Spaune of frogs spread on a cloth and dryd afterwards kept and applyd stops any bloud. J.L. R.L." Another note shows that Locke confirmed Harvey's work on the circulation of the blood, and demonstrated in a simple animal experiment the reflex activity of the nervous system. "Take a frog and strip it. You may see the circulation of bloud, if you hold him up against the sun. Take out the hart and the frog will leap about a great while after."⁷ Locke and Lower both rebelled against university orthodoxy: they were more interested in planning experiments and assisting the researches of Willis and Boyle than in attending formal lectures and disputations. Lower practised medicine for about ten years before accumulating the degrees of

bachelor and doctor of medicine in 1665. In the same year he published his defence of Willis's book on fevers, which took the form of an attack on classical medical orthodoxy.

John Locke (1632-1704), from a portrait by John Greenhill (1672). Published by permission of the National Portrait Gallery.

Colonel William Sydenham, played an increasingly important role. Having successfully led a revolt the Sydenhams thereafter endeavoured to resist the flood of revolutionary ideas which they had so recently helped to unleash. As country gentlemen they were totally opposed to any extension of democracy: indeed, Colonel Sydenham's technique was to rely on army support to force through Parliament measures which failed to command a majority. He was one of the founders of Cromwell's Protectorate, a Privy Councillor, a Commissioner of the Treasury, and later a member of the House of Lords. To his brother's powerful influence Thomas Sydenham already owed his college

Richard Lower (1631-1691). By permission of the Curator of the Ashmolean Museum, Oxford.

oblivion. He was now able to reward Thomas further by appointing him Comptroller of the Pipe, which was not a urological appointment but a department of the Exchequer concerned with the registration of Crown leases. Politics came first during these unsettled years before the Restoration reversed his family's fortune: thereafter medicine was to be Sydenham's sole concern. It is often forgotten that Sydenham was 37 years old in 1661 when he abandoned politics and began his study of the London epidemics. The Restoration favoured Willis. He was awarded the degree of doctor of medicine and appointed

Locke also practised as a physician to Lord Shaftesbury for several years before he graduated bachelor of medicine in 1674.

The Restoration

Meanwhile the Restoration of Charles II reversed the fortunes of both Willis and Sydenham. During the Interregnum Sydenham had practised somewhat fitfully, as he was absorbed in the struggle for power between Parliament and the army, in which his only surviving brother,

Colonel William Sydenham, played an increasingly important role. Having successfully led a revolt the Sydenhams thereafter endeavoured to resist the flood of revolutionary ideas which they had so recently helped to unleash. As country gentlemen they were totally opposed to any extension of democracy: indeed, Colonel Sydenham's technique was to rely on army support to force through Parliament measures which failed to command a majority. He was one of the founders of Cromwell's Protectorate, a Privy Councillor, a Commissioner of the Treasury, and later a member of the House of Lords. To his brother's powerful influence Thomas Sydenham already owed his college fellowship and a gratuity of £600 which had enabled him to start in practice. Thenceforth he continued to support his brother, as the spoils of office proved more tempting than the perverse luxury of a Puritan conscience. Thomas Sydenham unsuccessfully contested Weymouth in the only Parliamentary election of Richard Cromwell's brief Protectorate. Shortly afterwards Colonel Sydenham was one of the leaders of the Wallingford House party which forced Richard Cromwell into political

Sedleian Professor of Natural Philosophy at Christ Church. His practice increased, but he found time for anatomical studies of the brain which eventually led to the publication of *Cerebri Anatomie* (1664), embellished with the engravings of Christopher Wren. Willis was assisted by Richard Lower, whom he described as "a doctor of outstanding learning and an anatomist of supreme skill." But of *Cerebri Anatomie* Anthony Wood wrote⁸: "Whatsoever is anatomical in that book, the glory thereof belongs to the said R. Lower, whose indefatigable industry at Oxon produced that elaborate piece." There is no truth whatsoever in Wood's insinuations. Wood and Willis were neighbours, and a long-standing quarrel between their families gave rise to these spiteful remarks. Furthermore, Wood used this opportunity to enhance the reputation of Richard Lower, his friend, physician, and drinking companion, with whom he often rang the changes on the Castle Inn, the Crown, and the Mermaid.

The Circle of Willis

The research which led to the publication of *Cerebri Anatomie* is most objectively revealed in Lower's letters to Boyle, wherein Willis is mentioned with the greatest respect. In 1661 Willis began his studies on the cerebral circulation by injecting a liquid tintured "with saffron, or other colours, into the arterial carotides" in order "to try how the blood moves."⁸ The book was nearly finished two years later, when Lower wrote⁹: "Dr. Wren hath drawn most excellent schemes of the brain and the several parts of it, according to the doctor's design, and the next week he will have finished the scheme of the eighth pair of nerves, and then all the work is at an end."

Lower then discussed the background of Willis's discovery of the cerebral arterial circle which still bears his name. Having noticed at necropsy that the left carotid artery was completely occluded, Willis concluded that there was probably an anastomosis between the carotid and vertebral arteries allowing blood to reach all parts of the brain, "And to confirm this," wrote Lower,¹⁰ "this week we took a young spaniel, and tied both carotid arteries in the neck very fast and close with silk, and the dog was not at all altered by it, but continued very lively and brisk, and was so far from taking unkindly what was done to him, that within a quarter of an hour after, he got loose and followed the doctor into the town, as he visited his patients. In this pleasant humour he continued two or three days, and then we opened his head, and found all the vessels of the brain as full of blood as usually they are in other dogs, who did not suffer the same experiment. But this I might have told you in a shorter time; for if one artery be syringed with any tinted liquor, all the parts of the brain will equally be filled with it at the same time, as several times we have tried. . . ."

As well as carrying out research on the brain, Willis gave a series of medical lectures at Christ Church. He began by discussing such medico-philosophical topics as life, sense, and motion, and went on to deal with more practical matters, such as the treatment of colic, melancholia, and arthritis. He covered a wide field, including therapeutics, anatomy, physiology, and psychiatry. The full details of these lectures have come down to us in a notebook¹¹ belonging to John Locke, who attended them in 1664.

Experiments in Pulmonary Physiology

Although Locke was officially a classics don he spent more time studying medicine and science. He also began to assist in Lower's dissections. Lower had recently tried

to dissect out a passage between the ear and the mouth, as an acquaintance, Mr. Henshaw of All Souls, was able by stopping up his nose and mouth "to blow out a candle at either ear or both at once."¹² Having failed to establish such a connexion, Lower then turned to his main interest of pulmonary physiology. In particular he sought to explain the difference in colour between venous and arterial blood. Lower deduced that arterial blood arose in the ventricles "by a mixture of the aire with it which gives it volatilization and colour."¹³ But what caused venous blood to be changed into arterial in its passage from the right to the left side of the heart? What function did the air serve in respiration? And what was the role of the diaphragm? These were some of the problems which Locke helped him to solve. Fortunately, Locke jotted down his thoughts and deductions in a notebook from whence his association with Lower's research can be traced. Locke believed that respiration served to mix the "nitrous salts" of the air with the blood and "so volatilize it."¹⁴ Then he asked himself why rarefied air was less useful in respiration. Locke thought that this was due to the lack of salts, "which by Mr. Hooke are thought to be Niter which mixes with the blood in the aer of lower regions, or else because the pressure of the aer being lessened by the height of the place, it is scarce sufficient to lift up the lungs and soe respiration is hindered. . . ."¹⁵ Another entry suggests that Locke either performed animal experiments himself or assisted others. After mentioning that severance of the nerves to a dog's diaphragm causes immediate death he then asked: "Why cannot the motion of the thorax supply that at least for a little time unlesse the looseness of the diaphragm hinder it?"¹⁶ Locke made numerous other pertinent notes on pulmonary physiology before Robert Hooke showed that a continuous supply of fresh air (as well as the pumping action of the heart) was necessary to sustain life. Finally, Lower modified Hooke's experiment, and proved conclusively in his *Tractatus de Corde* (1669) that arterial blood differed from venous owing to its aeration in the lungs rather than to "fermentation" in the ventricles, as was previously believed. It is interesting to trace Locke's small part in this major physiological advance some four years before Lower's book was published.

London Practice

In 1667 all four physicians had moved to London. Lower practised from Hatton Gardens, while Locke, as physician to Lord Shaftesbury, lived at Exeter House in the Strand. Willis and Sydenham practised in Westminster. They were now professional rivals. And with customary tactlessness Sydenham let it be known that he did not rate Willis's clinical ability very highly. "Sydenham and some others in London," wrote Ward¹⁷ in his Diary, "say of Dr. Willis that hee is an ingenious man but not a good physitian, and that hee does not understand the way of practice." Why did Sydenham hold Willis's clinical ability in such low esteem? Probably because he had not accepted Sydenham's general ideas on fevers or his cooling regimen in smallpox. All his life Sydenham retained the forthright peppery characteristics of the cavalry officer, and he obviously had little in common with the more learned, bookish Willis. Although Sydenham was, in fact, the better practitioner, he imposed serious limitations on his research. Whereas Willis diligently sought for anatomical or pathological explanations of disease, Sydenham strictly confined his investigations to the "outer husk of things." Not only did he regard post-mortem examinations as totally mislead-

ing, but he also condemned the use of microscopes as being completely beyond God's purpose. Puritanism prevented him from adopting a truly scientific approach to medicine.

Locke and Sydenham

Soon after his arrival in London Locke sought an introduction to Sydenham, whose book on fevers had greatly impressed him during his last year in Oxford. He then served a clinical apprenticeship with Sydenham, whose influence completely changed the direction of his medical interests. Hitherto, Locke had been keen on research into the basic sciences, but he now exchanged the milieu of the laboratory for that of the sick-room, which was the only place, in Sydenham's opinion, where the manifestations of disease could be properly studied. In return Locke helped Sydenham in various ways. He encouraged his research into the London fevers; he supported his methods of treatment (particularly the cooling regimen in smallpox), and finally he helped Sydenham to get his opinions into print by occasionally serving as his amanuensis. Proof of their collaboration is to be found in a series of manuscripts¹⁸ in the Bodleian Library written during 1668 and 1669 which were meant to form an early draft of Sydenham's *Observationes Medicae* (1676). These notes written by Locke on Sydenham's behalf are heavily corrected, and the numerous marginal afterthoughts probably indicate that they were dictated by Sydenham.

Willis and Lower

While Sydenham continued his observations on the natural history of London fevers Willis was writing his *Rational Therapeutics*. Through the powerful support of the Archbishop of Canterbury Willis had acquired the most lucrative practice in London. "He became so noted, and so infinitely resorted to in his practice," wrote Wood,¹⁹ "that never any physician before went before him or got more money yearly than he." Lower's practice also flourished, as on four occasions he moved his residence to a more fashionable area. Sydenham, on the other hand, complained that he was only called to attend poorer patients. "Wherefor were shee one of those poor patients whom my lot engages me to attend," he grumbled, "(for I cure not the rich till by being in the ground makes me an Authority). . . ." The paucity of his practice (though probably exaggerated) had several causes. After the Restoration Sydenham could not, of course, expect the patronage of the wealthy Court circles whom he had so recently opposed. His blunt criticism of more orthodox physicians and his own therapeutic innovations (such as the cooling regimen in smallpox) brought him much professional hostility. And he lost many patients owing to the fact that he was constantly plagued with such painful afflictions as gout and renal calculus, which compelled him to give up practice for long periods. Nevertheless Locke regarded him as a much better practitioner than either Willis or Lower, and modelled his own small practice on Sydenham's methods. Indeed, after moving to London Locke ceased to make any further references to either Willis or Lower. This sudden disregard for his Oxford colleagues was certainly due to Sydenham's influence. The latter probably thought that they had spent too much time on anatomical and physiological experiments. Lower's experimental dexterity probably caused him to lose touch with therapeutic trends. At Oxford he had been in the habit of passing on various clinical recommendations to

Locke, who recorded them in his notebook. Here is Lower's prescription for healing wounds:

"Lint made of the shirt of a man of strong complexion will not suffer the wounds to heale that it is used on, but of a woman's smock after she hath had her courses will cure almost its selfe and hath a balsamack virtue . . ." R.L.²⁰

This recommendation, smacking more of sympathetic magic than of rational therapeutics, is followed by another bizarre prescription for preserving the complexion of fashionable ladies:

"Take 4 or 5 puppies before they be 9 days old. Cut them into 2 or 3 pieces and put them reakeing hott into a still, with their bloud and all the rest, destill them over a very gentle fire that they may not burne too, and when you have gott a pinte and halfe of water, use it morning and evening, and it will wonderfully plump the face and preserve it that noe paint doe the face harme by corrodeing. R.L."²¹

These are, of course, somewhat fantastic examples of Lower's remedies, and they possibly underestimate his clinical ability. But the fact that he refused to prescribe Peruvian bark when treating Charles II's malaria cannot be overlooked. The drug had been used since 1665, and a year later Sydenham had openly recommended it. He came out more strongly in its favour in his *Observationes Medicae* (1676). "Being asked why they did not prescribe it," wrote Evelyn,²² "Dr. Lower said it would spoil their practice, or some such expression." Charles II's eventual recovery was due to the ministrations of an apothecary, Robert Talbor, who used Peruvian bark. But this lapse did not affect Lower's popularity, as he became the most sought-after physician in London when he inherited Willis's practice after the latter's death in 1675. With his customary spitefulness Anthony Wood imputed Willis's death at the age of 54 "to drugery in the pursuit of lucre." But his brother-in-law, John Fell, declared him to have been generous to his patients and open-handed in his charity. He gave all the fees earned on Sundays (amounting to more than a tenth of his income) to the poor.²³

Willis's *Rational Therapeutics* remained the standard medical textbook until Sydenham's *Medical Observations* gradually replaced it after the latter's death in 1689. At first Sydenham's writings were more highly regarded on the Continent than at home, where his forthright manner earned him the hostility of his colleagues. But the worth of his acute clinical observations and of his nosological classification of diseases gradually came to be recognized after his death. He pioneered many useful therapeutic innovations, such as the introduction of quinine in the treatment of intermittent fevers; the use of steel filings in the treatment of chlorosis; and, in particular, the introduction of liquid laudanum, which replaced the solid pill mass previously used. And John Locke played a most important part in disseminating Sydenham's ideas and advocating his clinical methods during his long residence abroad.

The political upheavals of these unquiet times also affected the younger men. After Shaftesbury's downfall Locke sought asylum in Protestant Holland; and on the accession of James II Lower's Whig politics caused him to be deprived of his Court appointment. He lost all his wealthy patients and his practice fell into disrepute.

Conclusion

Although they lived through civil strife and experienced the fluctuations of political fortune, the achievements of these four Oxonians are amongst the most outstanding in the whole history of British medicine. They were in the

vanguard of two somewhat conflicting seventeenth century trends: the experimental and the empirical. The fame of Willis and Lower rests mainly on their experimental ingenuity, as their most notable discoveries were made by subjecting hypotheses to experimental proof or anatomical revelation. Sydenham, on the other hand, regarded such research as being totally irrelevant to the physician's main task of alleviating sickness. He thought that medical progress could best be achieved by discarding the trappings of preconceived hypotheses and studying instead the natural histories of the diseases which came under his care. His disciple Locke, whose subtle mind ranged over the whole keyboard of learning from theology to experimental science, reached a similar conclusion. And it was Locke's medical training, particularly his association with Sydenham, which caused him to formulate the whole empirical movement of modern philosophy in his *Essay Concerning Human Understanding*, described by Professor Gilbert Ryle as "not a theory of knowledge but a theory of the sciences."²⁴ In an age of highly speculative scientists, mystical alchemists, and Galenic doctors Locke's mission was to distinguish between the questions which may rightly be asked in the different branches of science. And in the company of Sydenham he modestly regarded his role as "working as an under-labourer in clearing the ground a little, and removing some of the rubbish that lies in the way of knowledge."

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The National Association for Mental Health has been revising all its publications dealing with the care, treatment, and training of the mentally subnormal and has prepared a "Mental Subnormality Series." The second booklet in the series, *Junior Training Centres*, by H. C. Gunzburg, gives an outline of the principles and practices of social education and training of mentally subnormal and severely subnormal children in junior training centres and hospitals, many of whom can be equipped to live and work in the community when grown up. It contains photographs of children engaged in various activities at existing training centres and a diagram indicating the provisions for children and young people below normal intelligence. (Price 3s. 6d., by post 3s. 9d., from N.A.M.H., 39 Queen Anne Street, London W.1.)