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PHYSICIANS

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## The rod of Aesculapios: John Haygarth (1740–1827) and Perkins' metallic tractors

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**Summary:** James Gillray's cartoon *Metallic Tractors*, published in 1801, portrays Benjamin Perkins treating a boil on the nose of an alcoholic John Bull with a pair of metallic tractors. The tractors had been invented by his father, Elisha Perkins of Connecticut, and were supposed to relieve pain and other symptoms through the agency of animal magnetism. The tractors were revealed as nothing more than an expensive sham by Dr John Haygarth in Bath, who showed that wooden tractors were equally effective. Thus, he was one of the first to use a placebo in a single-blind clinical trial.

James Gillray (1757–1815) was born in Chelsea in 1757, the son of a Scottish soldier who had lost an arm at the unfortunate Battle of Fontenoy in 1745. In 1775, at the age of 18, he began to sell engravings. He became the leading caricaturist in London and by the end of the century he had helped Hannah Humphrey to become the most successful print seller in the capital. Although most of his prints were political, he did not hesitate to attack the foibles of the day. One of the best-remembered of his prints is his *Metallic Tractors*, published in November 1801. The print portrays an operator, Benjamin Perkins, using his metallic tractors to treat a carbuncle on the nose of an alcoholic John Bull (Figure 1). The paper on the table beside the victim reads:

Grand exhibition in Leicester Square. Just arrived from America the Rod of Aesculapios. Perkinism in all its glory being a certain Cure for all Disorders. Red Noses, Gouty Toes, Windy Bowels, Broken Legs, Hump Backs. Just discover the Grand Secret of the Philosophers Stone with the True Way of turning all metals into Gold. Pro Bono Publico.<sup>1</sup>

The metallic tractors were the brainchild of an American physician, Dr Elisha Perkins (1741–99) of Plainfield, Connecticut. It was an era when dubious claims were being made by unscrupulous practitioners to exploit the mysterious force that was electricity. In 1791, Luigi Galvani (1737–98) had published his observations showing that the contraction of the muscles of the frog could be achieved through the agency of electricity. There were serious scientists who interested themselves in what they termed 'medical electricity', for

example Charles Hunnings Wilkinson of London and Bath,<sup>2</sup> but there were others who were undoubted imposters. In France, Franz Anton Mesmer (1734–1815) had made great claims, unsubstantiated by due investigation, for the importance of animal magnetism. Elisha Perkins always claimed that his metallic tractors depended for their action 'on the Galvanic principle'. In fact, as we shall see, he was as great a fraudster as Mesmer or James Graham with his Temple of Hymen and his Celestial Bed. There were many others, including Dr Theodor Myersbach and Dr Brodum, who successfully hoodwinked a gullible public for their financial advantage in that era. Furthermore, even so enlightened a soul as the Earl of Chesterfield would as soon take the nostrum of a quack as the prescription of his physician. The visit to the quack doctor was a feature of 18th-century life.

Elisha Perkins was an unlikely quack. He came from an old New England family, his forbear John Perkins having crossed the Atlantic as early as 1631. His father, Dr Joseph Perkins, was a highly respected doctor who practised in Norwich, Connecticut, where his son Elisha was born in 1741. Elisha is said to have been educated at Yale, but his medical training, entirely orthodox, was as an assistant to his father. He set up in practice at Plainfield, Connecticut, and in 1792 was one of the founders of the Connecticut State Medical Society.<sup>3</sup>

In the early 1780s, according to his son's account, he began the investigations that led to the discovery of his miraculous metallic tractors. He first noted that there was often a sudden contraction of a muscle when the point of a metallic instrument was put in contact with it during a surgical operation. He also observed that pain in a tooth might cease when a lancet or knife was employed before extracting it, as well as finding that the pain of inflamed or painful tumours might be relieved by the accidental application of a metallic instrument. At that time the experiments of Galvani seemed to confirm him in the view that

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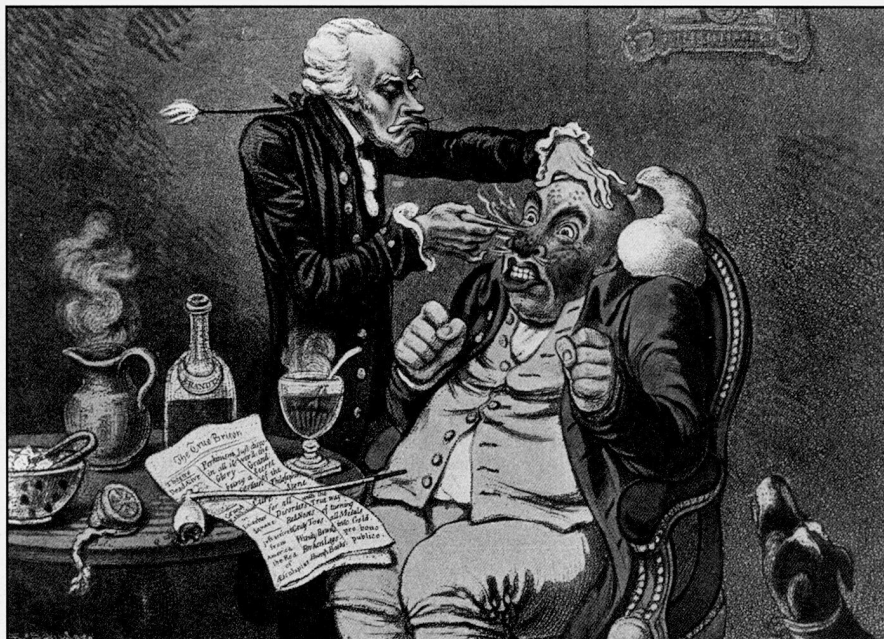


Figure 1 James Gilray's cartoon Metallic Tractors

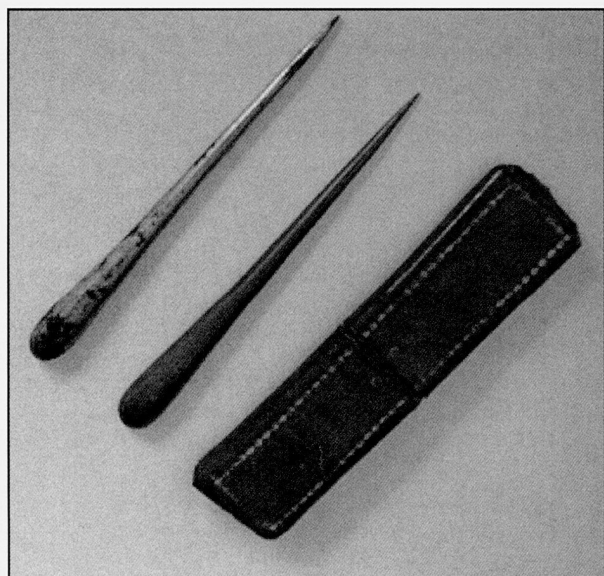


Figure 2 Perkins' metallic tractors. They were approximately 4 inches long. Courtesy of Alex Peck, Medical Antiques, Charleston, Illinois, IL 61920, USA

metals might be useful as external agents in medicine. At first uncertain, he had by the year 1795 convinced himself that certain metals applied to the body might relieve a variety of ailments, and so to his invention of the metallic tractors. They were, in fact, two rods of metal a few inches long – one half round and pointed at the end and the other flat, with *Perkins Patent Tractors* stamped upon it (Figure 2). They came in a smart case of red Moroccan leather. As to the composition of the tractors, one was supposedly made of copper, zinc

and a little gold, the other of iron with a little silver and platinum. Of course this was kept a close secret. They were used by applying the tractors to the affected part and drawing them away to some distance. Sometimes it was necessary to rub hard enough to redden the skin.

At the end of 1795, Elisha Perkins reported his discovery to a meeting of the Connecticut Medical Society. The members of that Society, unimpressible New Englanders, received Perkins' account with considerable scepticism. Undeterred, he took out a patent for his tractors and then went to Philadelphia, in those years the capital of the United States. The tractors were extraordinarily successful. The Board of Governors of the Philadelphia Almshouse – later to become the Philadelphia General Hospital – purchased the patent rights for the use of the tractors in Philadelphia. Congress was then in session and Perkins had the opportunity to demonstrate the remarkable powers of his tractors to the most distinguished people in the land. The President, George Washington no less, purchased a set for the use of his own family, as did the Chief Justice, the Honourable John Marshall, who gave his judgement that 'the effects wrought are not easily ascribed to imagination, great and delusive as is its power'. With the approbation of America's elite, it is not surprising that Perkins' tractors sold like hot cakes. A contemporary observer wrote: 'A gentleman in Virginia sold a plantation and took the pay for it in Tractors. Nothing was more common than to sell horses and carriages to buy them'.<sup>4</sup>

Back home, however, it was a case of no man being prophet in his own country. In May 1796, the canny members of the Connecticut Medical Society,

which specifically forbade the use of nostrums, expelled Dr Perkins from the Society. Undaunted, Perkins went on persuading the gullible to use his tractors, as well as another remedy, a dubious cordial. He went to New London and then to Boston to apply his treatments to the yellow fever then raging there. He went on to New York, where, despite the claims he made for his remedies, he himself succumbed to the fever. He died on 6 September 1799, at the early age of 59. There were those who have been generous enough to suggest that he was a victim of self-delusion and that he did in fact really believe in his tractors. But since he sold them for five guineas a pair when they only cost a shilling to make, it is difficult to conclude that he was out for anything but himself.

His son, however, was unquestionably an imposter. It is clear that Benjamin Perkins, 'son of the discoverer' as he termed himself, was 'a rogue of the first water'. A graduate of Yale in 1794, he came to England to exploit the use of his father's tractors in London, a city which was, to use Dr Johnson's telling phrase, 'the needy villain's general home'. He set up business in Leicester Square – hence the allusion in Gillray's cartoon – being shrewd enough to move into number 18, which had been John Hunter's house. From there the craze for the tractors spread throughout the city. In 1798 he took out a British patent for the tractors and in that same year he published a book with the pretentious title *The Influence of Metallic Tractors on the Human Body in removing Various Painful Inflammatory Diseases, such as Rheumatism, Pleurisy, some Gouty Affections, etc., Lately discovered by Dr Perkins of North America and demonstrated in a series of Experiments and Observations by Professor Meigs, Woodward and Rogers, etc., by which the Importance of the Discovery is fully ascertained and a New Field of Enquiry opened in the Modern Sciences of Galvanism or Animal Electricity*.<sup>5</sup> The main part of the book, apart from a biographical account of his father, is taken up with testimonials from physicians, grateful patients, clergymen and members of the nobility. The tractor craze swept through London and from there spread to other centres in Europe. In Copenhagen they enjoyed great success after being recommended by the Danish physicians, led by the then physician to the monarch.

But it was in Bath that the tractors were to meet their nemesis. Bath, the watering place for the rich, the fashionable and the gullible, was where the upper classes – powdered, rouged and bewigged – flirted at masked balls, played cards until dawn, recited scandal to each other and then retired to take the waters of the spa. In the background, guinea-collecting doctors hovered discreetly – among them the surgeon Mr Charles Cunningham Langworthy, who promoted the tractors in Bath. He had travelled to the United States, where he met Perkins Jr and had enjoyed his company on the voyage home. Perkins had engaged to supply the tractors to Langworthy, who thus acted as his agent

in Bath, a veritable paradise for the medical imposter. To help popularize the tractors, in 1798 Langworthy published a book: *A View of the Perkinian Electricity and an Enquiry into the Influence of Metallic Tractors*.<sup>6</sup> It began well with the following wise admonition:

Oppose no principle, because tis new,  
But first examine if the thing be TRUE;  
Up to its source and novel science trace,  
If false, reject it, but if true, embrace.

It is hardly surprising that, among the fashionable, the reputation of the tractors soon became firmly established. But in the same year that Langworthy's book appeared, a physician with an enquiring mind who was a Fellow of the Royal Society retired to Bath, where he was to live in the Royal Crescent. It was the chosen resort of the elite. As Jane Austen (1775–1817) put it in *Northanger Abbey*, it was to the Royal Crescent that the Allens and the Thorpes repaired to 'breathe the fresh air of genteel company'. The new owner of number 15 had been a successful physician in the northern city of Chester and he now intended to use his retirement to analyse the copious records of his practice that he had amassed. He was Dr John Haygarth.<sup>7</sup>

John Haygarth came from a background very different from that of Elisha Perkins. Haygarth was a blunt Yorkshireman, born in Garsdale, the beautiful but isolated valley of the River Clough, and brought up in the family home, Swarthgill (Figure 3). He was educated at nearby Sedbergh School, but was particularly fortunate in his mathematics teacher, John Dawson (1734–1820). Dawson, a farmer's son a few years older than Haygarth, was a remarkable self-taught mathematician who is said to have worked out a system of conic sections while watching his father's sheep on the hillsides of Garsdale. Although working as Sedbergh's humble surgeon, this rural intellect became increasingly known for his genius as a mathematical tutor, and undergraduates from



Figure 3 Swarthgill in Garsdale

Cambridge used to come to study with him during the summer months. By the time he retired, he had tutored 11 men who went on to become senior wranglers. Haygarth was his pupil in 1756, and from his master learnt the numerical skills that were to serve him so well during his medical career.<sup>8</sup>

He went first to Cambridge, then to Edinburgh, where between 1762 and 1765 he was a student of the eminent William Cullen (1710–90). Several of his fellow students were to become lifelong friends. These included Thomas Percival (1740–1804), later of Manchester, and the American Arthur Lee (1740–92), protégé of Benjamin Franklin. But the most important was undoubtedly William Falconer (1744–1824), whose father was the Recorder of the City of Chester.<sup>9</sup> The Falconers were influential and well-to-do. William Falconer's elder brother Thomas (1738–92) was a liberal patron of literature and the arts. Anna Seward called him 'the Mycenae of Chester'. It was likely his connection with the Falconers that led to Haygarth's appointment in 1767 as physician to the Chester Infirmary, founded just over 10 years earlier. William Falconer, MD of Edinburgh, was appointed in 1766 to a similar position at the same time. The two men were representative of that new breed of provincial physicians, usually graduates of either Leiden or Edinburgh, who staffed the newly founded hospitals in provincial cities throughout the land. During their time in Chester, they made the acquaintance of the famous London Quaker physician Dr John Fothergill (1712–80).<sup>10</sup> Like Haygarth, an alumnus of Sedbergh School, Fothergill was a fellow dalesman, born in 1712 at Carr End in Wensleydale. To obtain some respite from his frenetic life in London, Fothergill and his sister Ann repaired during the summer months to a country retreat, Lea Hall, which was only 20 miles from Chester. There the young physicians to the Chester Infirmary would ride over to visit Fothergill, who was a role model to them both. It had been Fothergill who, through the press, had seen his friend Benjamin Franklin's experiments on electricity. It was at Lea Hall they met John Coakley Lettsom (1744–1815), Fothergill's protégé, and later the founder of the Medical Society of London in 1773, whom they both knew well in later years. However, Falconer did not stay in Chester. Apparently, it was Fothergill who advised him in 1770 to move to Bath. He was elected to the Royal Society in 1773 and was to be a highly successful practitioner for many years, writing extensively on the use of mineral waters. Like Haygarth, he had a mathematical bent, using statistical analysis to assess the efficacy of treatment. Some of Falconer's correspondence with Fothergill is included in the memoir of his patron that Lettsom wrote after Fothergill's death in 1780.

Nevertheless, Haygarth soldiered on in Chester and developed a highly successful practice. He wrote later that he had noted and classed the cases

of 10,549 patients, as well as those of 'a large number of persons in the lower ranks of life'. We are given a tantalizing glimpse of him by Mrs Thrale (1741–1821), Dr Johnson's admired hostess, who wrote in 1795 that her niece Cecilia, having made a runaway marriage with one John Mostyn, was 'frightened into fits on her wedding night ... her husband kindly got Dr Haygarth to prescribe for her at Chester'.<sup>11</sup>

But Haygarth's important contribution to the medicine of his day was to introduce into general hospitals separate wards for the reception of fever patients, who until then had been refused entry. He described the population and diseases of Chester in a paper read to the Royal Society and published in the *Philosophical Transactions* in 1778.<sup>12</sup> He was elected a Fellow two years later. He wrote extensively on smallpox and its prevention, putting forward proposals in 1793 designed to achieve its eradication from Great Britain. His findings were always recorded meticulously, betraying his passion for numeracy and often including calculations made for him by his old mathematical tutor in Sedbergh.

Why Haygarth decided to retire to Bath is uncertain, but it seems likely that his old friend William Falconer may have influenced his decision. His home at number 15 The Royal Crescent (Figure 4) was a short walk from the Circus, where Falconer lived at number 29, in some style. By the

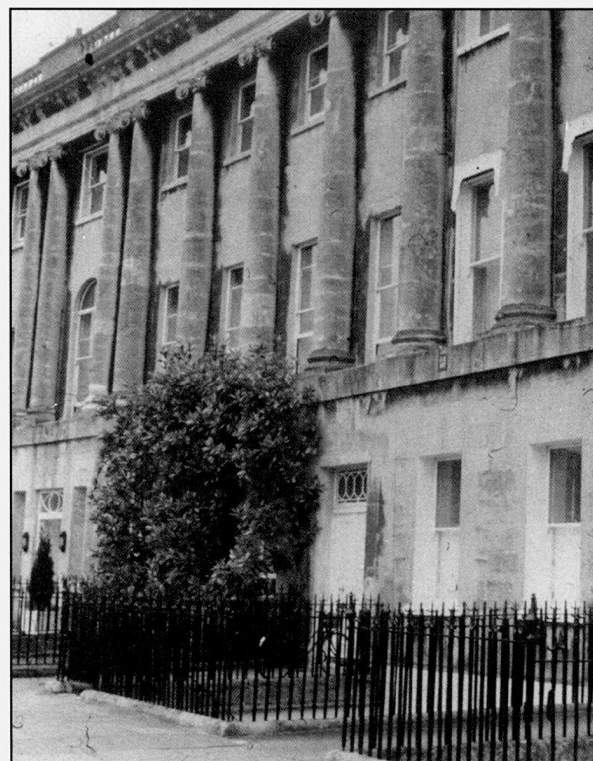


Figure 4 Number 15, The Royal Crescent, Bath. It is now part of the Royal Crescent Hotel

time that Haygarth arrived in Bath in 1798, the year that Edward Jenner (1749–1823) published his famous book on the cowpox, Falconer was a highly experienced practitioner with a well deserved reputation as a scientific physician. He was a Corresponding Member of Lettsom's Medical Society. He had an interest in the effects of suggestion and imagination in medicine. In 1788, he responded to the Medical Society of London's proposal for a prize essay on *The Influence of the Passions upon Disorders of the Body*,<sup>13</sup> and he won the Gold Medal of the Society, an award that had been established by Lettsom in honour of his patron Dr Fothergill. Falconer wrote on the effects of fear and other passions, including the imagination. He was outspoken in his dismissal of Mesmer. Benjamin Franklin, scientist of electricity, had chaired the commissioners charged by the French King with the examination of animal magnetism. They had proved, wrote Falconer, 'by the most decisive experiments, that the imagination alone is capable of producing all those convulsive effects, which have been falsely attributed to the power of the magnet'. On the power of suggestion, he quoted James Lind (1716–94), who in his work on scurvy wrote that he was always wary of fictitious cures, warning of 'the wonderful and powerful influence of the passions of the mind upon the state and disorders of the body'.

Haygarth too had been made aware in his practice in Chester of the dangers of suggestion. He had experience of epidemic convulsions in young women, a condition he thought unquestionably was spread by suggestion. So convinced was he that young women with this disorder would influence others that he barred them from his wards at the Chester Infirmary.

Haygarth and Falconer, both scientific gentlemen, must naturally have been highly suspicious of Perkins' metallic tractors, then the talk of the town, so they decided to devise an experiment to put the tractors to the test. What they agreed to do was set out in a letter written by Haygarth to his friend William Falconer: 'The Tractors have obtained such high reputation at Bath, even among persons of rank and understanding, as to require the particular attention of physicians'. He went on:

Let their merit be impartially investigated.... Prepare a pair of false, exactly to resemble the true Tractors. Let the secret be kept inviolable, not only from the patient, but every other person. Let the efficacy of both be impartially tried, beginning always with the false Tractors. The cases should be accurately stated, and the reports of the effects produced by the true and false Tractors be fully stated, in the words of the patients.

The false tractors were made of wood, a material that clearly could not be influenced by either electricity or any spurious animal magnetism.

The tests were carried out over two days on five patients at the Bath Infirmary in the presence of Haygarth and Falconer, and also by Richard Smith

in Bristol. Equal effects were obtained both with the true and with the false tractors. Furthermore, the same results could be obtained by using pieces of bone, slate pencils or painted tobacco pipes. Haygarth at once wrote up the findings and published them in 1800, in a pamphlet dedicated to Falconer 'as a memorial of a mutual, cordial and constant friendship for thirty-six years'. It was entitled *On the Imagination as a Cause and Cure of Disease of the Body exemplified by fictitious Tractors and epidemical Convulsions*.<sup>14</sup> He had delivered a blow that, if not immediately devastating, was ultimately to prove mortal to the reputation of Perkins' metallic tractors.

The results of his study spread rapidly among the practitioners of Bath. Dr Anthony Fothergill (1734–1813), namesake but no relation of Dr John, wrote to a friend in November 1799 from his home in Walcot Parade that 'Dr Haygarth on the Tractors is in the press'.<sup>15</sup> Haygarth, however, was concerned to ensure his findings should be distributed much more widely. He wrote to his publishers in January 1800 that 'As the poison is widely dispersed, so shd be the antidote'.<sup>16</sup> In all, 63 copies were to go to Bristol, 50 to supply the demand in Bath, and further copies were to go to Dublin and Cork, as well as to the different towns in England. He also listed more than 50 individual physicians and friends who were to receive copies. They included Dr Heberden, Sir Lucas Pepys (1742–1830), Dr Willan and Dr Lettsom in London, as well as others in Chester (Dr Thackeray, for example, who was his successor there), Manchester (Dr Percival), Liverpool (Dr Currie) and Edinburgh (Dr Monro, Duncan and Gregory).

The pamphlet was reviewed widely. But it was the *Gentleman's Magazine* that was the most perceptive. The editor wrote:

We seldom remember in the course of our medical criticisms to have received more pleasure or satisfaction than what the perusal of this short but excellent essay hath afforded us. From a subject so apparently barren and useless as that of the metallic tractors, which, in point of medical as well as mechanical virtues, have always in our estimation ranked much below those of a tenpenny nail, we little expected to meet with a most useful and ingenious medical publication, entitled from its intrinsic merit, to the serious perusal and attention of every practitioner...<sup>17</sup>

There were others who repeated Haygarth's experiment. Sir William Watson (1744–1825) in London, son of the distinguished physician of the same name, and Dr Moncrieff in Bristol both reported similar results. In Hull, Dr Alderson used sham wooden tractors with such effect that five patients, miraculously cured of their ailments, gave thanks in church for their deliverance.

But one of the most active opponents of quackery in all its forms was a Mr Thomas Wilkinson, a rich West Country farmer. One afternoon he gathered together his people on the village green. He

pilloried Dr Brodum's nervous cordial and then, having produced a burn on the paw of his dog Pompey with a red hot poker, applied the true tractors, which were supposed to relieve such lesions, even in veterinary practice.<sup>18</sup> Pompey, however, being unimaginative, was unimpressed and went off howling to his kennel. Wilkinson then addressed the company: 'You have this day discovered the inefficiency of Patent and Quack Medicines', he announced. 'Let me never again hear any of you extol such ridiculous publications'.<sup>19</sup>

Gillray's cartoon came out in 1801, the year after Haygarth's publication. Other cartoonists joined the fray. The next year Charles Williams portrayed Mrs Ford, a society lady known for her venomous tongue, being treated with the tractors for half-hints, innuendoes, hypocrisy, envy, scandal, detraction and malignity. The piece of paper beside her reminds her to spread the news that Miss Lively was living far beyond her visible means, the implication being obvious. The title read: *The Tractors. A new discovered virtue in these invaluable operators most cordially recommended to the Public at Large, and to Dr Perkins in particular as a likely means of preventing more murder than all the poenal Statutes.*<sup>20</sup> Such ridicule helped destroy the reputation of the metallic tractors. As Dr Johnson put it: 'cheats can seldom stand long against laughter'.

But the use of the tractors did not die out at once. Society was then, as now, a slave to fashion. A correspondent wrote to the *Gentleman's Magazine*: 'Are we not ... governed by Fashion, and frequently made a victim by it? And while we find five guineas for a pair of tractors, the poor perish for lack of food at our doors.'

Benjamin Perkins continued in numerous publications to extol the virtues of his father's tractors, quoting endlessly the cures that they had wrought and the letters from the influential people who supported him. He dismissed Haygarth as having simply 'made a great noise' and having circulated his findings with remarkable industry in order to discredit the metallic tractors.<sup>21</sup> He also turned to charity. He wrote that 'servants, artificers, labourers, soldiers, etc., from their necessary exposure to the vicissitudes of the weather, are perpetually subject to those diseases which are most readily cured by the new remedy'. A charity was founded in 1803 and the Perkinian Institution for the use of the metallic tractors in the disorders of the poor was opened in Frith Street, Soho, in London. The extraordinary commitment of the upper classes to what was a piece of outrageous chicanery was no different then from the penchant for fringe medicine among those over-privileged few who inhabit palaces today. The Perkinian Institution was run by an imposing committee, with Lord Rivers as President and Governor Franklin of all people, son of Benjamin Franklin no less, as one of its Vice-Presidents. A grand opening dinner was held at the

Crown and Anchor tavern on 15 July 1803, where a poetical address was delivered. It began:

See Pointed Metals, blest with power t'appease,  
The ruthless rage of merciless disease,  
O'er the frail part a subtil fluid pour,  
Drench'd with invisible Galvanic Shower,  
Till the arthritic, staff and crutch forego,  
And leap exulting like a bounding roe!<sup>22</sup>

There were still those authors who wrote in defence of the tractors. In 1803 Thomas Green Fessenden, an American like Perkins, and writing under the pseudonym of Sir Christopher Caustic MD LID, published a satirical poem addressed to the Royal College of Physicians, which was supposedly an attack on Perkinism, but was in reality a clever defence of the tractors and a satyr on orthodox medicine.<sup>23</sup>

Thanks to the revelations of Haygarth and their endorsement by the most widely read periodical of that era, the *Gentleman's Magazine*, the next few years saw total loss of faith in the tractors and this brought about a radical change in public feeling. By 1809, Byron was to write:

What varied wonders tempt us as they pass!  
The cow-pox, tractors, galvanism and gas,  
In turns appear, to make the vulgar stare,  
Till the swoln bubble bursts – and all is air.

But before the bubble burst, Benjamin Perkins had escaped to his native America with, according to contemporary accounts, £10,000 profit from his father's tractors. He died in New York City in 1810 at the early age of 36. Sadly, the cartoonist who lampooned him so mercilessly had by now begun to lose his sight. James Gillray, despite trying spectacles, was increasingly unable to ply his trade and began to drink heavily. He produced his last print in 1809 and died in 1815, the year of Waterloo.

However, both destroyers of the reputation of Perkins metallic tractors lived into ripe old age. William Falconer died at his house in the Circus in 1824, much lamented at the age of 80. Haygarth lived longer, and at the age of 82 sent his portrait (Figure 5) to his relations in far-off Garsdale.<sup>24</sup> His descendants gave it to the Infirmary in Chester where he had laboured so long. A year later, we find him writing in a clear strong hand to his successor in Chester, Dr W M Thackeray (1769–1849), cousin of the novelist.

Haygarth died at Lambridge House near Bath on a summer's day in June 1827 at the age of 87 years. He was buried in the village of Swainswick in a simple tomb at the small but beautiful church dating from Norman times. On the wall of the nave is a large marble tablet. Among other eulogies, the inscription reads:

He may be remembered as a PHYSICIAN who advanced the cause of medical science through his writings and exercised much sagacity in his treatment of diseases. As a

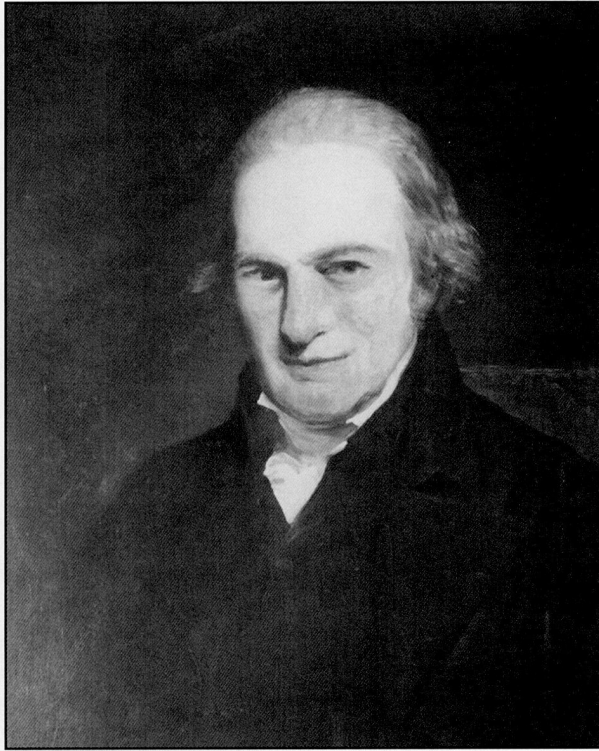


Figure 5 Portrait of the elderly John Haygarth, artist unknown. Courtesy of Dr Giles Young and the Countess of Chester Hospital, Chester, UK

PHILOSOPHER he is known to have added to the Stock of well authenticated facts concerning the influence of the mind upon the Body.

As the *Gentleman's Magazine* put it 200 years ago, his work is entitled 'to the serious perusal and attention of every practitioner'. That is as true today as when it was written. Happily, we can now find Haygarth's tract on the imagination on the Website of the James Lind Library, set up by Ulrich Trohler, Iain Chalmers and their colleagues at the Royal College of Physicians of Edinburgh. They claim it as an early example of a single-blind placebo trial. It also shows that only science can destroy a quack: denunciation is not enough, as Lettsom found to his cost when he tried unsuccessfully to expose the disreputable Dr Brodum as an imposter.

## References and notes

- 1 Courtesy of the Royal College of Physicians of London. An excellent example of this print is held in the iconographic collections of the Wellcome Library for the History and Understanding of Medicine, London. Roy Porter included this print in *Bodies Politic. Disease, Death and Doctors in Britain, 1650-1900*. London: Reaktion Books, 2001: plate 49
- 2 Thornton JL. Charles Hunnings Wilkinson. *Annals of Science* 1967;23:198-202
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- 4 Bishop WJ. Elisha Perkins and his metallic tractors. *British Journal of Rheumatic Diseases* 1939;1:193-206. This excellent article, by a distinguished librarian, is comprehensive and the best account of the metallic tractor affair
- 5 Perkins B. *The Influence of Metallic Tractors on the Human Body &c* .... London: J Johnson and Ogilvy and Son, 1798
- 6 Langworthy CC. *A View of Perkinian electricity, or, an enquiry into the influence of metallic tractors founded on a newly-discovered principle in nature, and employed as a remedy in many painful inflammatory disorders &c* .... Bath: R Crutwell, 1798
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- 12 Haygarth J. Observations on the population and diseases of Chester. *Philosophical Transactions of the Royal Society of London* 1778;66:151
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- 14 Haygarth J. *On the Imagination as a Cause and as a Cure of Disease of the Body Exemplified by Fictitious Tractors and Epidemical Convulsions*. Bath: R Crutwell, 1800
- 15 Lawrence C, Lucier P, Booth CC. 'Take Time by the Forelock.' *The Letters of Anthony Fothergill to James Woodforde, 1789-1813*. *Medical History*, Supplement No. 17, 1997: p. 78
- 16 MS autograph letter, John Haygarth to his publishers Cadell and Davies, dated Bath 6 January 1800. By permission of the Wellcome Library for the History and Understanding of Medicine, London
- 17 Anon. *Gentleman's Magazine* March 1800: vol. 70, p. 253
- 18 Perkins BD. *New Cases of Practice with Perkins Metallic Tractors, on the Human Body and on Animals; But Especially on Infants and Horses, Chiefly from the Medical and Clerical Professions, With a Confrontation of Every Attack Upon the Metallic Practice*.... London: J Johnson, 1802
- 19 Cory J. *The Detection of Quackery; or, Analysis of Medical, Philosophical, Political, Dramatic, and Literary Imposture*. London: B Crosby, 1802
- 20 Williams C. *The Tractors &c* ... London, 1802. A print of this cartoon is held in the iconographic collections of the Wellcome Library for the History and Understanding of Medicine, London. This print is also included in Porter R (op. cit. ref. 1): plate 50. Porter identifies the lady as a Mrs Thicknesse, who notoriously quarrelled with her husband in public
- 21 Perkins BD. *The efficacy of Perkins Metallic Tractors on the human body and animals ... to which is prefixed a preliminary discourse, in which, the fallacious attempts of Dr Haygarth to detract from the merits of the tractors, are detected and fully confuted*. London: J Johnson, 1800
- 22 Bishop WJ (op. cit. ref. 3)
- 23 Caustic C, MD LID (TG Fessenden). *A Poetic Petition against Tractorian Trumpery, and the Perkinian Institution, in four Cantos ... addressed to the Royal College of Physicians*. London: T Hurst and J Ginger, 1802
- 24 Weaver GH. John Haygarth. Portrait, letter and descendants. *Bulletin of the Society for Medical History of Chicago* 1928-36;4:264-7