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## BIOGRAPHICAL SKETCH

### Biographical sketch: Giles Brindley, FRS

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Professor Giles Brindley MD, FRCP, FRS (Fig. 1) is one of Britain's great physiologists. Coming from humble beginnings, Brindley became a world-renowned figure in the research and innovation of visual neuroscience, neural stimulators, and urology, in addition to achieving prowess in musical engineering and athletics. A Fellow of the Royal Society, his contributions to neurosurgery were the invention and production of a multitude of neuroprostheses, including stimulators of the spinal cord to treat chronic pain, and sacral nerve roots for urological and sexual function in spinal cord injury. Many were made in his back bedroom in an era before medical devices became dominated by multinational corporations.

Giles Skey Brindley was born on 30th of April 1926 in Woking, Surrey, to Arthur James Skey and Margaret Beatrice Marion (née Dewhurst). When Brindley was only four, his father left the family, leaving his mother to support the household by herself. Being medically qualified, her work comprised ad hoc locums and assistantships. Brindley was a boarder at Combecote School in Dartmouth from the ages of four to seven, and seldom saw his mother. In 1933, she established a general practice in a disused doctor's surgery in Leytonstone, the takings in her first week being just 19 shillings and sixpence. Brindley moved from his Devon boarding school to Elson House, a Leytonstone private school, then to Leyton County High School. The latter was evacuated to Brentwood, Brindley opting to cycle around 120 miles a week to commute from home. Brindley did his first research while still at school, developing a volumetric analysis for cuprous chloride, and its solubility in organic solvents. In 1944, Margaret married a solicitor, and persuaded her son to take his surname, Brindley.

Brindley studied natural sciences at Downing College Cambridge with a county major award, early research involving a histochemical test for carbolic anhydrase. He attained a first class degree, and an open scholarship to the London Hospital clinical school. It is there that Brindley first published a scientific paper: a letter to Nature on the scintillation of stars.<sup>1</sup> Once medically qualified, Brindley had firmly decided that research rather than clinical practice was for him, and pursued a grant from the UK Medical Research Council to

return to Cambridge as a physiologist in 1951. After a year, he took up RAF national service, having been exempt from war duty as a medical student. He trained in Lancashire, worked as a Unit Medical Officer in Norfolk then conducted research at Farnborough at the RAF Institute of Aviation Medicine, where he developed aviation clothing. He was permitted to investigate aspects of aviation-related human vision, yielding several publications,<sup>2,3</sup> before returning to Cambridge as a demonstrator in 1954.

In 1958, Brindley married Lucy Dunk Bennell, with whom he played in a string quartet throughout their 4-year marriage. Brindley became a research fellow at King's College Cambridge, and soon after became a university lecturer. During this period, his research was devoted almost entirely to vision. It varied from investigating colour vision to the interaction of light and electricity stimulating the eye. Brindley was made a fellow of Trinity College Cambridge in 1962. That summer he travelled to Baltimore, having been offered a chair of physiology there. The journey was otherwise fruitful, in that Brindley met his soon-to-be wife, Hilary Richards. Upon returning to Britain, Brindley left Lucy and married Hilary.



Fig. 1. Giles Skey Brindley, FRS.

Brindley's first non-RAF applied work was with visual prostheses, where he managed to stimulate areas of the visual cortex to enable some sight in the blind.<sup>4</sup> After the first implant in a blind nurse, she could visually read braille although tactile reading was still quicker. Grant support for further work arose from Nobel prize-winning physiologist Alan Hodgkin after the UK MRC initially turned Brindley down. Brindley was soon after awarded Fellowship of The Royal Society in 1965 and the MRC later founded the neurological prostheses unit in London, which existed from 1968 until 1992. Brindley moved to London to set up the unit and accepted the chair of physiology at the Institute of Psychiatry in 1969. The group then focused upon spinal nerve stimulation techniques for walking and bladder control in spinal cord injury. One result was the hugely successful sacral anterior stimulator, which has changed little from Brindley's original invention over 30 years ago,<sup>5</sup> and was commercialised by Finetech in 1982.<sup>6</sup>

Brindley's work has been published a great number of times, and his articles span neurosciences, from the theoretical to animal and human research.<sup>7,8</sup> Early studies and reflections included work on cerebellar learning,<sup>9</sup> a mantle famously explored by Brindley's doctoral student David Marr. A common theme throughout Brindley's research has been combining theoretical neuroscience insights with deft, often ingenious, engineering.

Brindley was rarely conventional, and would quickly dispel today's staid perception of a laboratory scientist on many occasions. He recalls one particular experiment from his Cambridge days that was published as a communication, which was concerned with recovery of balance after a sudden change of direction in animals.<sup>10,11</sup> For this study, Brindley and Hilary, with a live rabbit in a box, drove to a disused runway at Duxford aerodrome. Hilary drove along the edge of the main runway, and suddenly swerved the car into a circular orbit. A few seconds later, the bottom of the box opened, and Brindley took photographs of the falling rabbit. Hilary had to maintain the same speed (32 km/h) throughout, sufficient to create the gravitational forces necessary for the experiment, but not so much as to overturn the car.

Along with contemporaries such as Patrick Merton, Brindley was a firm believer that an experimenter should be subject to the same procedures as they expected of their participants, where possible. In one publication, thanks are given to the "volunteer subjects for their fortitude and collaboration" with respect to the often painful maximal contraction of the external urethral sphincter caused by stimulation of the pudendal nerves.<sup>12</sup> Brindley was of course one of the subjects. To this day, Brindley has a device in his scrotum, which has been safely implanted for over 20 years, and still delivers an erection by drug delivery at the push of a button. Brindley looks back on his experiments with fondness, able to vividly describe the circumstances surrounding them.

Until the early 1980s, Brindley would use his expertise in electro-ejaculation activity in paraplegic men to provide a fertility service around England. He would spend a week visiting spinal injury units four times a year, resulting in widespread uptake of sacral stimulation nationwide.

Possibly the most notorious event in Brindley's life is that of the 1983 American Urological Association conference in Las Vegas. The story went viral with the advent of the internet, but is often recounted erroneously. Brindley himself recalls it as follows. Meaning to present his novel findings of intracavernosal phenoxybenzamine injection for the production of erection, he was set to supplement his standard slide presentation with a demonstration of his previously injected penis – albeit not overly blatantly – through his orienteering trousers. Upon this demonstration at the end of the presentation, the chairman asked if he would show his penis uncovered. Brindley, who assumed that the trained urologists in the audience would not be shocked by such a show-and-tell, was more concerned with the possible presence of journalists. Somewhat hesitantly, and after being assured that there were no journalists in the audience, Brindley uncovered the full extent of his results to the somewhat surprised urologists. The event has been hailed by numerous urologists as one of the most defining moments in the history of treating erectile dysfunction.

Brindley retired as professor of physiology at age 65, but stayed a further year at the MRC unit before beginning a business with his wife – making medical devices from his home. These included stress incontinence slings, artificial tendons, and spinal cord stimulators, almost entirely for the NHS with the occasional private purchaser. After about 7 years, following changes in NHS insurance standards, the business closed. Brindley also followed up patients with his prostheses implanted in an outpatient clinic at the Royal National Orthopaedic Hospital in Stanmore until he was 70.



Fig. 2. Brindley playing his 'logical bassoon' in the late 1960s.

Brindley was well known for his musical talent. In his youth, he would buy cheap second-hand instruments in junk shops. As a child he converted his first high-pitched flute to a low-pitched one. In 1968, he invented the logical bassoon (Fig. 2), an instrument with its linkages converted from mechanical to electrical resulting in its becoming far easier to play sequences of higher notes.<sup>13,14</sup> He continues to work on new prototypes of it and repair and service his neuroprostheses to this day. His compositions have also accomplished success, for example The Four Temperaments (four variations on a theme from Schoenberg's Wind Quintet opus 26), which was performed at the Spitalfields festival; and the Tyrolean Suite, a piece performed at the opening of the British Library.

In his sixth decade, Brindley took up veteran athletics. He completed the London marathon in 3 h and 1 min, won a bronze medal at the 1987 World Veterans Championships 4 × 400 m relay and then, in the 1991 World Veterans'

Championships, silver medals for 2000 m steeplechase and 800 m, and another bronze for the 4 × 400 m relay.

Brindley's wife, Hilary, died in 2011. He has two children, and three grandchildren. He is currently studying the origins of falsetto, and maintains a busy music schedule attending concerts and playing in amateur orchestras and chamber music groups.

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