Harold Hopkins and the Fibrescope

Jonathan Charles Goddard,
Curator of the BAUS Virtual Museum for the History of Urology,
Consultant Urological Surgeon, Leicester General Hospital.

Correspondence to:
jonathan.goddard@uhl-tr.nhs.uk

Figure 1: Harold Hopkins.

In this series of articles I am going to show you some of the exhibits contained in the BAUS Virtual Museum of the History of Urology which is part of the BAUS website (www.baus.org.uk). In the last article we looked at the collaboration between Harold Hopkins (Figure 1) and Karl Storz which produced the Rod lens and cold light cystoscope that revolutionised urology. Harold Hopkins (1918-1994), a genius in the world of optics, made many major contributions to science. These included the Airy disc theory, understanding of wave aberrations leading to improved lens design, early work on lasers which led to compact discs and the invention of the zoom lens for TV cameras (incidentally, first used by the BBC at Lords in 1948). In medicine, as well as his rod lens the most important contribution was fibre optics.

In 1951, Hopkins was at a dinner party given by an old army colleague where he met and chatted with a gastroenterologist from St Georges called Hugh Gainsborough. Gainsborough was complaining about the inadequate instruments available to view the stomach lining. Hopkins realised that a flexible instrument was needed. He applied the principle that light shone onto the end of a glass fibre surrounded by air (or any medium with a refractive index lower than glass) (Figure 2) will bounce down that fibre with only a small loss in intensity. A bundle of these fibres, perfectly aligned, would allow light to be transmitted down and an image transmitted back.

In 1954, Hopkins and his research student, Narinder Singh Kapani published their idea in a letter in *Nature*. It details how they made a bundle of 0.025mm glass fibres (Figure 3) and produced the first legible image with their new 'Fibrescope'. Interestingly, in the same issue of *Nature*, there was a second letter by A Van Heal of Delft who also transmitted light along bundles of plastic fibres. Actually, the idea had already been patented by Logie Baird in 1927.

Sadly, because of lack of backing and thus funds, Hopkins could never make the fibrescope and it was a South African, Basil Hirschowitz, who made the first flexible fibreoptic gastroscope using Hopkins's idea.

In a sad twist of fate, Harold Hopkins, the man who revolutionised urology, died of metastatic prostate cancer in 1994 and the genius of optical science was rendered blind by retinal haemorrhages just before his death.

In this and the previous article we have seen Hopkins and Storz advance modern urology through the science of physics and optics. In the next article I would like to take you back 1000 years and introduce you to the modern science of that time, magic. Fans of Harry Potter will have heard of Beadle the Bard, but who was Bald the Leech? Find out in the next article.

Figure 2 left: A four inch cube of experimental low refractive index glass used to surround the fibres and thus contain the light.

Figure 3 above: A bundle of early fibre optic lengths, 0.04mm diameter.