Harold Hopkins: a visionary across specialties

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On 7 June 2018, the Urology Section of the Royal Society of Medicine (RSM) is hosting a symposium, in the elegant surroundings of Chandos House, on the life and work of Harold Hopkins (1918–1994). Hopkins is well known to urologists: his brilliant work on the rod lens was pivotal to the development of endourology in the last quarter of the 20th century. Although the symposium is being hosted by the Urology Section, this will not be a urological meeting; Hopkins’ work affected many spheres of medicine and, indeed, non-medical areas. Speakers from upper and lower gastrointestinal (GI) surgery, hepatobiliary surgery, gastroenterology, gynaecology and orthopaedics will join with urologists and optical scientists to remind us all how the inspired work of Hopkins influenced and furthered science and medicine.

The venue for the symposium, Chandos House, the Grade I listed Georgian townhouse annex of the RSM, could not be further from the humble beginnings of Hopkins’ life. Born in Leicester, the son of a baker, he was the last child of six and his family struggled in the hard economic times of the 1920s and ‘30s. His mother, however, worked hard to educate her children well. Hopkins attended the local state school and Sunday school, and was encouraged to take up free organ lessons at church and go to concerts of the Leicester Symphony Orchestra. This all paid off, as in 1929 he won a scholarship to the local technical college. From there, with another scholarship, he moved up to University College Leicester, graduating in physics and mathematics in 1939.

On completing his degree, Hopkins began working in a Leicester optics company, Taylor, Taylor and Hopson. At this time optics and lenses were an important part of the war effort. He subsequently moved to WW Watsons and Son Ltd, an optics company in Barnet, as director of research and development. He was awarded a doctorate in 1945, and joined Imperial College as a research fellow in 1947. In 1967 he took the first Chair of Optical Physics at the University of Reading, where he stayed until his retirement in 1984.

In medicine and particularly in urology, Hopkins is associated with two major innovations: fibre optics and the solid rod lens system.
Interestingly, gastroscopy fibres could be used to illuminate the GI tract in Hopson. Harold Hopkins had the idea that flexible of Urology by Mr ED Lodge of Taylor, Taylor and Hopson. Harold Hopkins had the idea that flexible fibres could be used to illuminate the GI tract in gastroscopy. In 1954, Hopkins and his research student Narinder Singh Kapany published their idea in a letter in Nature, describing how, using a bundle of 0.025mm glass fibres, they produced the first legible image with their new ‘Fibrescope’.1 Interestingly, in the same issue of Nature, there was a second letter by a Dutch researcher who had also transmitted light along bundles of plastic fibres.2 The idea had actually been patented by John Logie Baird in 1927. The difference in Hopkins’ article, however, was that he had not only conceived the idea, he had studied how to practically manufacture it. Sadly, because of a lack of backing and funds, Hopkins could never make the fibrescope and it was a South African, Basil Hirschowitz, who made the first flexible fibreoptic gastroscope using Hopkins’ idea.

In 1957, Hopkins was approached by Jim Gow, a urologist from Liverpool, who was frustrated by the difficulty of photographing bladder tumours via a conventional cystoscope, the main problem being the lack of illumination. Hopkins’ solution was to redesign the lens system. The conventional lens system had a series of glass lenses arranged one behind the other with large air gaps between; Hopkins’ rod lens system reversed this, with long glass lenses and small air gaps. Glass is a better conductor of light than air, and less air/glass interfaces reduced scatter. Combined with a double antireflective coating, this increased light transmission by 80 times.3

Once again Hopkins failed to find a British manufacturer to take his idea forward into production. In 1965, German surgeon George Berci told his friend Karl Stortz, an instrument manufacturer, about the new cystoscope designed by Harold Hopkins. Stortz telephoned Hopkins, speaking in broken English; Hopkins, a talented linguist, replied in fluent German allowing them to discuss his new invention.

At this time, illumination was by miniature electric bulbs on the end of scopes, which were notoriously fragile and emitted heat. In 1960, Stortz developed a cold light source, which reflected very bright light from an external light source into the body cavity. Using Hopkins’ design and Stortz’s instrument-making skills, they were able to launch the rod lens cystoscope in 1967. The Hopkins lens and the Stortz cold light system revolutionised endoscopy and urology.

Harold Hopkins, a genius in the world of optics, made many major contributions to science. As well as his innovations in medicine they include the Airy disc theory, an understanding of wave aberrations which led to improved lens design; early work on lasers, leading to compact discs; and the invention of the zoom lens for TV cameras (incidentally, first used by the BBC at Lords in 1948).

In a sad twist of fate, 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.

2020 sees the 75th anniversary of the foundation of the British Association of Urological Surgeons (BAUS) and the centenary of the Urology Section of the RSM. During the build-up to this celebratory year for British urology, Trends in Urology and Men’s Health will be looking at aspects of these two institutions which have supported urologists for all those years and continue to do so. The RSM Harold Hopkins symposium is a wonderful opportunity to learn about one of the most important figures in the modern history of urology.


Declaration of interests: none declared.

REFERENCES