

Milestones

Ian Donald : the pioneer of ultrasound in medicine

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Obstetric ultrasound is a multidisciplinary subject. This is its strength and its weakness. The contribution of radiologists and radiographers, obstetricians, neonatologists, pediatricians, geneticists, physicists and scientists have expressed their skills in the development and made this a rich and exciting subject. Indeed, the one who can lead such a team of highly skilled, disparate professionals, would be a giant in the field. Professor Ian Donald was such a persona.

The history of ultrasound is quite short. The first practical application of ultrasound was the effort of French physicist Paul Langevin, to detect submarines during the First World War. Results were not achieved in time for the war but his work formed the basis of sonar (sound navigation and ranging) detection¹. In

the 1940s, work was being done in applying the principles of sonar detection to medical sciences in Austria by Karl Dussik, Japan by Tanaka and Wagai and in the United States by Wild and Howry. The clinical application of their techniques was limited by impracticalities and very poor image production. In this background emerged Ian Donald, who in later years, came to be known as the founder father of ultrasound in obstetrics, gynecology and much of clinical medicine. It was his vision, persistence and eloquent advocacy that brought ultrasound to the important place it occupies in the diagnostic armamentarium.

Ian Donald (Figure 1) was born in Cornwall, UK in 1910, the son and grandson of Scottish doctors. The family moved to South Africa in his childhood and he graduated from the University of Capetown. He returned to England



Figure 1. Professor Ian Donald in 1955.

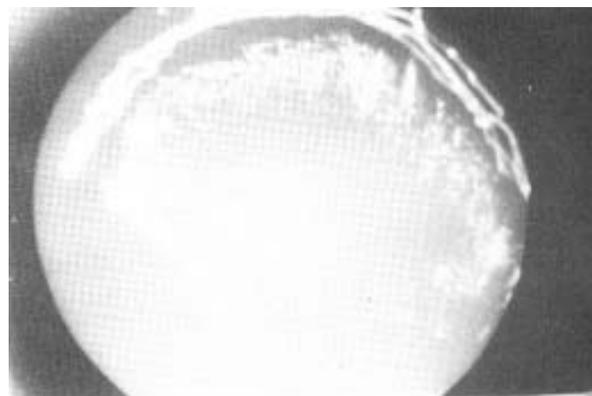


Figure 2. The first compound sector scan of a patient with ovarian carcinoma, 1957

in 1931 and studied medicine at St Thomas' Hospital and Medical School and qualified in 1937. At one stage, he was interested in psychiatry as a career. This train of thought was interrupted by the Second World War when he joined the Royal Air Force in 1939. He was a decorated war hero for his gallantry in the war. More importantly, service in the RAF stimulated his interest in gadgetry, electronics and machinery. At the end of the war, he returned to London and worked under the masters of the era such as Wrigley, Reid and Bonney. His early work was on the respiration of newborns and he devised an apparatus called a Pneumatron, which was a patient cycled respirator. His talents were spotted by the Vice Chancellor of the University of Glasgow, Sir Hector Hetherington, who wanted to build a modern medical school in Glasgow. In 1954, Ian Donald was appointed to the Regius Chair of Midwifery at the University of Glasgow. At the time, he worked on and published one of the most readable and entertaining books on obstetrics. This was a treatise titled "Practical Obstetric Problems", which became immensely popular the world over ².

In those days, Ian Donald's research interests turned to the idea that sonar detection could be applied to medical diagnosis. In July 1955, he visited Babcock and Wilcox at Renfrew. This was a boiler maker industry and the visit was set up by a grateful patient. He took recently excised gynecological tumors, fibroids and cysts and experimented with a large industrial ultrasonic flaw detector using a large steak as a control. He immersed these in a bath and produced some echoes which were difficult to interpret, in addition to being cumbersome to obtain. A young apprentice in the company, Tom Brown, heard about these experiments and collaborated with Professor Donald. He introduced the concept of a contact scanner and also fashioned a cathode ray tube to be attached to the instrument. Contact scanning meant that the unwieldy methods of passing ultrasound beams through buckets of water balanced precariously on the patient's abdomen could be done away with and the procedure became much more patient and physician friendly. As with many a great venture, early results were disappointing and the enterprise was greeted with a mixture of skepticism and ridicule. A lucky break came in 1957 when a woman thought to have terminal malignancy and massive ascites was scanned and diagnosed to have a benign ovarian cyst. She was operated upon and made

a swift recovery. Ultrasound had saved a life for the first time. Work progressed furiously thereon and improvements in technology led to the development of a compound sector scanner which produced recognizable images (Figure 2). The work was published in the *Lancet* in 1958 ³. The tone of the paper was modest and gave importance to the instant feedback which was received from the operative room in making improvements to the scanning technique and interpretation of images. In 1966, ultrasound as a technique, barely survived a major crash with the factory supplying the equipment closing down. The University of Glasgow was by then confident of his work and backed him to set up his own Ultrasound Department and hired the best available talent at that time. Through this time, the University also opened a new maternity hospital. Professor Donald was deeply committed to it and played a key role in its planning, administration and working.

On the personal front, he was decorated with numerous awards, degrees and fellowships including a Commander of the British Empire (CBE) in 1973. He was diagnosed to have rheumatic heart disease and underwent his first (of three) open heart surgery in 1962. He faced failing health with astonishing courage before passing away at the age of 77. Most people who knew him were impressed not only by his inventiveness but also by his clinical skills. He was an enthusiastic teacher, a brilliant orator and a master actor-manager. A fitting international recognition would have been a Nobel Prize in Medicine but this was not to be. If one seeks Ian Donald's memorial, one need not look further than most maternity hospitals in the world, where ultrasound is a routine part of antenatal care.

References

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2. Willocks J. Ian Donald and the birth of obstetric ultrasound. In: Neilson JP, Chambers SE. *Obstetric Ultrasound 1*. Oxford: Oxford University Press, 1993; 1-17.
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It was pioneered in the | Find, read and cite all the research you need on ResearchGate. The ultrasound has become quite commonplace in Obstetrics and Gynaecology. Its advent is however of fairly recent origin. It was pioneered in the late 1950s but has seen a meteoric rise to become the most important discovery of the twentieth century. It was the vision, eloquence and persistence of one man from Glasgow that saw its birth and widespread use. The man was Professor Ian Donald. This is his story, his dream. Discover the world's research. The Ian Donald Gold Medal is awarded once a year to an individual who has made a significant scientific contribution to the advancement of diagnostic ultrasound in Obstetrics and Gynecology and who has changed the way ultrasound is practiced through research or innovation. Mr Davor Jurkovic (UK) Ian Donald Gold Medal, 2020; ISUOG Fellowship, 2006. 2020 Gold Medal Award article. Professor Stuart Campbell is a pioneer of Ultrasound Diagnosis in medicine. He has introduced many new techniques such as the routine pregnancy scan, the early diagnosis of fetal abnormalities, the assessment of fetal growth and wellbeing and ultrasound screening for ovarian cancer. Ian Donald was an obstetrician who developed ultrasound diagnostics during the twentieth century in Europe. Ultrasound is a medical diagnostic technique that uses sound waves to produce images of the inside of the body. During the early 1900s, physicians had no way to see inside a woman's uterus during pregnancy. Donald developed the first method of scanning human internal anatomy in real time, which enabled doctors to diagnose potentially fatal tumors and cysts. The frequency range and energy level used in ultrasound are low enough so as to not be harmful to human tissue, yet high enough to provide considerable image detail. Ian Donald - Pioneer of Obstetric Ultrasound. Journal of Medical Sciences and Research 5 (2014): 83-84. How to cite.