

The West of England Medical Journal Vol 115 No.1 Article 2
Bristol Medico-Historical Society Proceedings

EDITH AND FLORENCE STONEY, X-RAY PIONEERS

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Presented 16.6.2014



Figure 1

Edith (L) and Florence (R) Stoney. c. 1910. (Newnham College Archive.)

Edith Anne Stoney (1869-1938) and Florence Ada Stoney (1870 – 1932) (Figure 1) were born in Dublin into a scientific family. Their father, G. Johnstone Stoney FRS, an eminent physicist, coined the term ‘electron’ in 1891 as the “fundamental unit quantity of electricity”, four years before its experimental demonstration

by J J Thomson. Their engineer uncle Bindon Blood Stoney, their engineer brother Gerald and their physicist cousin, George FitzGerald, were all awarded FRS ^[1].

The girls were educated privately and then at the Royal College for Science of Ireland. Edith gained a scholarship to Newnham College, Cambridge, where she achieved a First in the Part I Maths Tripos examination in 1893. She was later awarded MA from Trinity College Dublin, after they accepted women in 1904. After graduation she carried out some difficult calculations on marine turbine engines and searchlight design for Sir Charles Parsons, and then took a mathematics teaching post at Cheltenham Ladies' College.

By this time, Florence had started training at the London School of Medicine for Women (LSMW) where she obtained her MD in 1898. The following year Edith moved back to London when she was appointed as physics lecturer at the LSMW ^[2] (Figure 2).



Figure 2. Edith Stoney teaching in her physics laboratory at the London (Royal Free) School of Medicine for Women. c. 1910.
(Royal Free Archives, London Metropolitan Archives.)

Florence was working as an anatomy demonstrator at LSMW and as a clinical assistant in ENT at the Royal Free Hospital. In 1901 she was also appointed to the post of medical electrician. The two sisters set about selecting, purchasing and installing x-ray equipment and, the following April, a new x-ray service was opened ^[3].

Florence soon moved to the New Hospital for Women to become the head of the electrical department, and in 1906 set up in practice in Harley Street. She developed her skills and knowledge in radiology and electrotherapy. In particular she started to use x-rays to treat uterine fibroids and ophthalmic goitre ^[4]. In 1914 she travelled in America, visiting a number of radiological centres to learn of best practice there ^[5]. She returned with one of the new Coolidge tubes and became one of the very first to start using this technological breakthrough in Britain.

The two women were also actively involved the women's movement. As the first treasurer of the Federation of Women Graduates, Edith pressed for women to be permitted to practice law, to take senior positions in prison management and, later, receive training to fill jobs vacated by men during the war ^[6].

Britain declared war on Germany on 4 August 1914. The same day, Florence and Edith offered their services to the British Red Cross at the War office in London to provide a radiological service to support the troops in Europe. Their offer was refused, because they were women. Undaunted, Florence became the medical lead of an all-women unit funded by the Women's Imperial Service League. They established a hospital in Antwerp in September, but were quickly in retreat from the German advance. They then set up in Cherbourg, accepting casualties brought in by sea. Edith organised supplies from London where she also served on the League's committee ^[7]. Florence returned to London in March 1915, her arrival coinciding with Edith's resignation from the LSMW.

Florence was then appointed as head of radiology at the 1000-bed

Fullham Military Hospital, one of the first women to be accepted by the War Office. After the war she would be awarded the OBE for her services there. Edith contacted the Scottish Women's Hospitals (SWH), an organisation formed in 1914 to give medical support in the field of battle, financed by the women's suffrage movement. In June 1915 she set off to Europe, and would be away for most of the next four years. The SWH had gained agreement to set up a new 250-bed tented hospital at Troyes^[8]. It was Edith's task to plan and operate the x-ray facilities, for which her only assistant in this otherwise all-female unit was George Mallett, a young engineer who had been trained by her sister. Following her sister's lead, she established methods for the geometric localization of bullets and shrapnel and introduced the use of x-rays in the diagnosis of gas gangrene, interstitial gas being a mandate for immediate amputation to give any chance of survival^[9] (Figures 3 and 4).



Figure 3 Cloudy shadow on radiograph, indicative of gas gangrene.^[9]

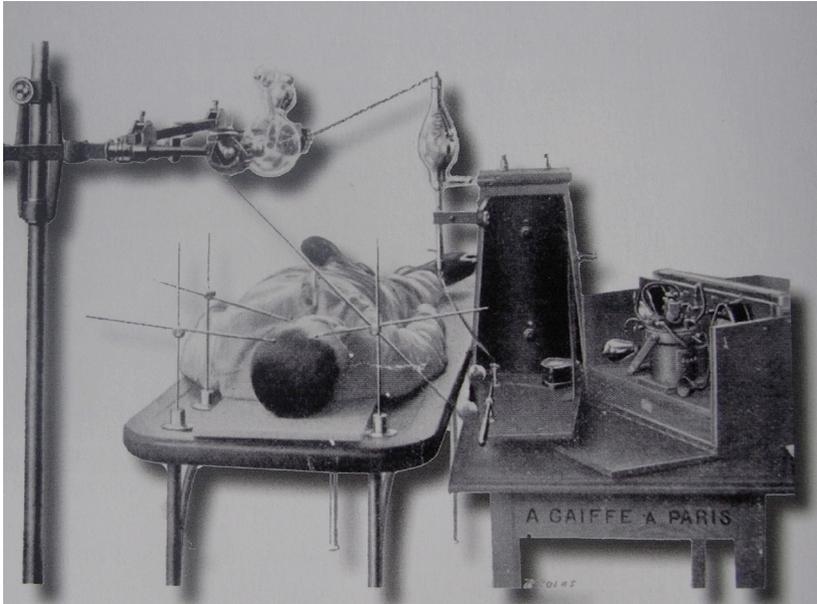


Figure 4 One of the complex methods for the location of foreign bodies introduced during WWI.

These summer months in northern France acclimatized Edith to the challenge of front-line military radiography, with its traumatically injured soldiers and difficult working conditions. In September, they were assigned to the Corps Expéditionnaire d'Orient, and set off for Serbia. Edith was concerned about the availability of electricity where they were going and, when her request for a generator was turned down, she bought one herself during a lightning visit to Paris.

By early November the unit had reached Ghevgheli in Serbia where they set up in an unused silk factory. The conditions were cold and difficult but Edith reported that the view was lovely and the air was bracing. However, they were on the southern flank of a losing battle for Serbia against the Bulgarian forces. By December

6th they were back in Salonica, evacuated down the single-track railway, the factory burnt and blown up behind them^[10].

Edith spent most of 1916 running the x-ray service in the camp in Salonica, ably assisted by Mallett, and working closely with a Parisian physicist, Charles Géneau, who was running an equivalent service in the neighbouring French hospital. They were in a war zone still, with air raids once or twice a week. Having set up the electricity supply, Edith established an electrotherapy department, including electrical massage, ionisation therapy, high-frequency heating, electrical baths and heat lamps. But not all went smoothly. When the x-ray van arrived she found that it had insufficient clearance for the rough roads, and vibration from the dynamo caused blurring of the x-ray images (Figure 5).



Figure 5. The x-ray van of the London Unit of the Scottish Women's Hospitals, based at Royaumont, France.^[16] . (Wellcome Library, London.)

The summer months were hot and difficult, with staff illnesses and patients with malaria and dysentery. Finally, in October 1917, she returned to northern France to lead the X-ray departments at the SWH hospitals at Royaumont and Villers-Cotterêts.

In March 1918, she once more had to supervise a camp closure and retreat, when Villers-Cotterêts was overrun by the advancing front. During the final months of the war the fighting intensified and there was a huge increase in workload. In the month of June 1918 alone the x-ray workload peaked at over 1300, partly resulting from an increased use of fluoroscopy (Figure 6).

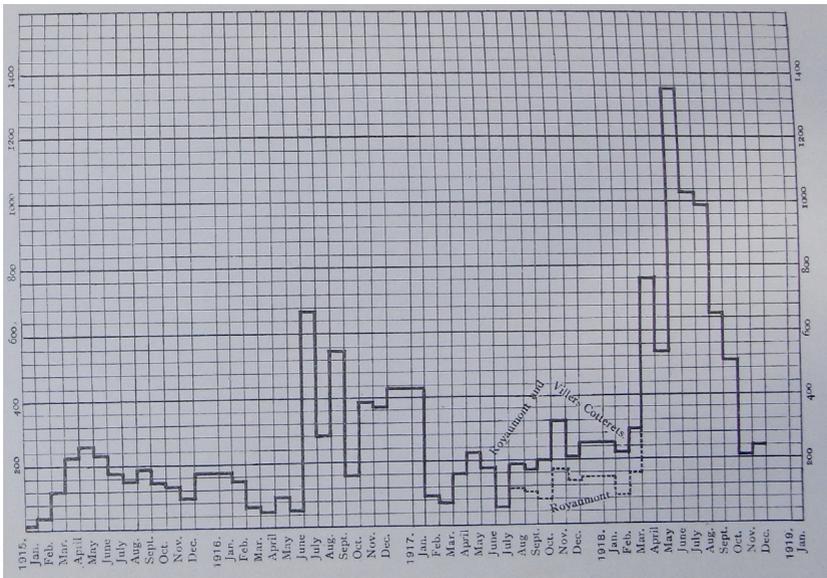


Figure 6

Edith Stoney's statistical report showing the large increase in x-ray studies in the summer of 1918 at Royaumont and Villers-Cotterêts. [8] 380.

(Wellcome Library, London.)

This arose partly from the immediateness of the diagnosis and partly from concern about the escalating cost of film. However, it also resulted in an increased incidence of radiation burns to Edith's staff, two of whom had to take sick leave to recover.

From London, Florence recognised the extreme strain her sister was under. She wrote " We may indeed be proud of them all but I fear there will be a heavy aftermath to pay for the great overwork they are undergoing. Here, in London, we think we are busy, but it is a backwater compared to Royaumont," adding "She is not at all well – it is the price she has to pay for the help she has given during the war. Few people realise what the constant strain of x-ray work If she had been in the army she would have had a pension." ^[11] The last point was important. Edith needed work at the end of the war, but met considerable resistance when she tried to capitalize on her radiological skills, because she was not medically qualified and also partly because she was a woman ^[12]. After the war ended she went back to academic physics, teaching at King's College for Women, before retiring in 1925.

Florence's health was suffering by the end of the war, and she moved to Bournemouth where she practiced radiology part-time. Edith joined her after her retirement, and they travelled together, including trips to India and South Africa, where Florence studied the association between UV exposure, vitamin D and skeletal development. Following Florence's early death from vertebral cancer in 1932, Edith continued to travel. She represented the British Federation for University Women in Australia, and set up a travel bursary for scientific women graduates, which she supported by a further £3000 legacy when she died in 1938.

Obituaries recognised the contributions that both women had made to radiology and to the cause of women's education ^[13,14,15]. They were highly intelligent, tough and single-minded

women. They both demonstrated high organizational skills in challenging circumstances. They showed considerable bravery and resourcefulness in the face of extreme danger, and imagination in contributing to clinical care under the most difficult conditions of war. In the history of early years of radiology and of medical physics, Edith and Florence Stoney stand out as two of the most able pioneers.

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