Edith Stoney MA, the first woman medical physicist

Francis Duck describes a formidable woman who showed bravery and resourcefulness to become a most able pioneer of medical physics

Edith Anne Stoney (1869–1938) was born in Dublin into a scientific family. Her father, G. Johnstone Stoney FRS, an eminent physicist, coined the term ‘electron’ in 1891 as the ‘fundamental unit quantity of electricity’, 4 years before its experimental demonstration by J. J. Thomson. Her engineer brother Gerald and her physicist cousin, George FitzGerald, were both made FRS. She was distantly related to the code-breaker Alan Turing. Her sister Florence became a radiologist and was awarded the OBE. Undoubtedly, the Stoney’s were a formidably talented scientific family.

As a young woman, Edith demonstrated considerable mathematical talent, gaining a scholarship at Newnham College, Cambridge, where she achieved a First in the Part I Tripos examination in 1893. Extraordinarily, she was never awarded her Cambridge degree: women were excluded from graduation, a situation that would not change for another 50 years. She was later awarded BA and MA degrees from Trinity College Dublin, after they accepted women in 1904. Career possibilities for university women were limited. She carried out some difficult calculations on gas electricity, 4 years before its experimental demonstration by J. J. Thomson. Her engineer brother Gerald and her physicist cousin, George FitzGerald, were both made FRS. She was distantly related to the code-breaker Alan Turing. Her sister Florence became a radiologist and was awarded the OBE. Undoubtedly, the Stoneys were a formidably talented scientific family.

London (Royal Free) School of Medicine for Women

The 1876 Medical Act had made it illegal for academic institutions to prevent access to medical education on the basis of gender. Anticipating this change in the law, the London School of Medicine for Women was established in 1874 as the first medical school for women in Britain. It soon became part of the University of London, with clinical teaching at the Royal Free Hospital. Edith’s sister Florence studied there, obtaining her MD in 1898. By this time, many details of her total estimate must, I fear, be somewhat inaccurate.

In 1901, the Royal Free Hospital appointed Florence to an electric main with over 200 volts it does not do to turn one handle after another and observe results. When you have a delicate electrical instrument connected in order, so that since the instrument has been kept locked, and only those are allowed to use it who understand how to work it. When you have a delicate electrical instrument connected to an electric main with over 200 volts it does not do to blindly turn one handle after another and observe results. During the next few years Edith actively supported the women’s suffrage movement, though opposed the direct violent action with which it was later associated. The years from 1910–1915 did not go smoothly for her. After her father’s death in 1911 she no longer had his guidance to call on. As student numbers increased so...
did her staff, but they often did not stay long, finding her difficult to work with. Finally, in March 1915, she left: it was recorded that ‘with due regret and most unwillingly a change is desirable in the physics lectureship’. Edith Stoney was offered £300 on tendering her resignation.

Into wartime France

Her career crisis was not helped by events in Ireland and in Europe. Britain declared war on 4th 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 set up her own unit with the Women’s Imperial Service League and spent the next 6 months in Europe. Edith organised supplies from London where she also served on the League’s committee.¹ Florence returned to London in March 1915, her arrival coinciding with Edith’s resignation.

Edith was now free from other commitments and could make her own contribution to the war. She 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 May she set off to Europe, and would be away for most of the next 4 years. The SWH had gained agreement to set up a new 250-bed tented hospital at Troyes,⁶ funded by the Cambridge women’s colleges of Girton and Newnham. It was Edith’s task to plan and operate the x-ray facilities (figure 2). She established stereoscopy to localise 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.

With the French Army to Serbia

Edith was by now in her mid-forties, and had spent her whole career until then as an academic teacher of mathematics and physics. These summer months in northern France acclimatised her to the challenge of military radiography (figure 3), with its traumatically injured soldiers and difficult working conditions. It could have crushed a weaker character. The hospital was close to the front line and, in her own words,⁷ by September 1915, ‘the town had been evacuated, the station had been mined, and we heard the heavy guns ever going at night time’. They were ordered to move, assigned to the Corps Expéditionnaire d’Orient. They only had a few days to pack up and prepare for departure, and Edith launched herself with dedication into the next phase. Apart from the need for last-minute organisation, it was hard physical work for the women to pack up the whole tented hospital, weighing three or four hundred tons.⁸

Edith was concerned about the availability of electricity where they were headed: ‘I feared [and it proved to be true] that the Serbia we were probably going into was by now a war-swept country, and that, in any case, the hospital would fail as a surgical hospital if we were located where the x-rays could not be worked’. ➤
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The loft with its ill-fitting shutters served as a dormitory. The pharmacy was set up on the landings. Edith added that the view was lovely and the air was bracing. By the next day she had the Perkins dynamo going and they had light, and very soon thereafter they were taking radiographs. The weather had steadily deteriorated. The operating theatre was poorly lit, ‘a tiny room into which all of us who were needed could hardly fit’. They had some 100 patients coming and going, some with frostbite, and others with severe lung and head wounds.

It was often late before I could stop the little engine and pack it up warm for the night. The ‘dark room’ could not be used while the engine worked, so that my photography came later. The dark room was partly in the flue of the tall factory chimney, and the blizzard streamed through the outhouse.
where I was, and up the chimney. When I creaked up the ladders in stockinged feet to the loft where 54 of us now slept, there could be no thought of washing with ice already in the jug.

Retreat to Salonika
They were on the southern flank of a losing battle for Serbia against the Bulgarian forces. As the battle turned, ‘the civil population poured in their hundreds past our camp towards Greece all day long; women, children, old men, donkeys laden with queer goods… The tots of four or five were left behind in those mountain villages, too heavy to carry, too wee to walk’. By 6th December they were back in Salonika, evacuated down the single-track railway, the silk factory burnt and blown up behind them as they left.

By 17th December they had re-established the hospital on a drained low swamp by the sea, and by New Year’s Day 1917 Edith had the lights on and the x-rays working. Her light-proof tent for use as a dark room was delayed for 6 months, so she had to do all of her processing after dark. They were in a war zone still, with air raids once or twice a week.

At first there was less need for x-ray work so, with time on her hands, and a supply of electricity, Edith set about establishing an electrotherapy department (with supplies similar to that shown in figure 4). Some equipment, such as the electrical massage unit and equipment for ionisation therapy, she had brought with her. High-frequency heating was available as a by-product of the x-ray equipment. For other techniques she improvised, using whatever was available. Hot-air baths and lamps (shades made out of old cocoa tins) gave local surface heating. Electro-cautery was also arranged.

She did not just restrict herself to electrical equipment when she saw a need that challenged her scientific skills. She had seen a system for controlled muscular exercise, working over pulleys against weights, known as the Zander apparatus, when on an earlier visit to Paris. With help from her assistant she set up a similar system, and used it for the muscular rehabilitation of the soldiers in their care. It is a testament to Edith Stoney’s ingenuity that she was able to establish these methods for physical therapy in a field hospital in a war zone.

By this stage in the conflict, x-ray vans were being introduced to provide radiological services away from established hospitals, and Edith was keen to obtain one for use in the region around Salonika.7 However, when it arrived she was disappointed. The 5½ inch clearance was insufficient for the rough roads, and the dynamo gave rise to distorting vibrations. She was more successful in assisting with problems on two British hospital ships, on which the x-ray systems had been damaged during a storm, and in giving support to the SWH unit in Ostoševac in Serbia, which arrived during 1917.

The summer months were hot and difficult, with staff illnesses and patients with malaria and dysentery. She had a break for sick leave in December and then returned until the following summer. She applied for an appointment as an army camp radiologist in Salonika, but was blocked by the War Office. Finally, in October 1917, she returned to northern France to lead the x-ray departments at the SWH hospitals at Royaumont and Villers Cotterets, including the x-ray van she had coveted when in Salonika (figure 5).

In March 1918, and for the third time, she had to supervise a camp closure and retreat, when Villers Cotterets 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 1,300, partly resulting from an increased use of fluoroscopy. This arose because there was no need to wait for film to be developed before a diagnosis could be reached, and also because there was 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.

There are thumbnail sketches of her at this time: ‘Grey uniform, grey hair, pale blue eyes, very intent on her job, – no special friend – no other interests, in and out of the x-ray rooms and developing rooms like a moth’. And another description: ‘A learned scientist, no longer young, a mere wraith of a woman, but her physical endurance seemed to be infinite; she could carry heavy loads of equipment, repair electric wires sitting astride ridge tents in a howling gale, and work tirelessly on an almost starvation diet’.8

She had been toughened by her wartime experiences, and expected her colleagues to meet her own high standards of commitment and performance. She had a reputation for working exceedingly long hours, and also for being a difficult and unusual colleague. A Canadian surgeon who met her in Salonika described her as a ‘most weird old person’, perhaps demonstrating how difficult he found it to place her into a preconceived female stereotype. She was justifiably furious to discover that the ‘duplicates’ in a number of stereoscopic pairs of x-ray films, intended for archiving, had been thrown away. She also met resistance because she had no medical qualification. ‘The sister did not like to work under me as I was not qualified medically – it is a funny world – that I have four university degrees would count nothing to her even if she knew it.’

England and retirement
Her war service was recognised by the medals that she was awarded: from France, the Médaille des épidémies.
and the Croix de Guerre; from Serbia, the Order of St Sava; and the Victory and British War Medals from Serbia, the Order of St Sava; and the Victory and British War Medals from


6 The unit was entirely female, except for two part-time male drivers, and Edith Stoney’s technical assistant, Mr Mallett.
