



WOMEN, SCIENCE AND SUFFRAGE IN WORLD WAR I

by

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Oh! This War! How it is tearing down walls and barriers, and battering in fast shut doors . . .

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World War I is often said to have benefited British women by giving them the vote and by enabling them to take on traditionally male roles, including ones in science, engineering and medicine. In reality, conventional hierarchies were rapidly re-established after the Armistice. Concentrating mainly on a small group of well-qualified scientific and medical women, marginalized at the time and also in the secondary literature, I review the attitudes they experienced and the work they undertook during and immediately after the war. The effects of century-old prejudices are still felt today.

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To celebrate its 350th anniversary in 2010, the Royal Society invited an academic panel to select the 10 women in British history who have had the most influence on science.¹ From the eighteenth-century astronomer Caroline Herschel to the geneticist Anne McLaren, their very different experiences demonstrate the remarkable changes in attitudes towards female scientists during the past quarter millennium. Whereas Herschel (the subject of Emily Winterburn's article²) had been the first woman to receive a salary for her scientific work, by the time of World War I, there were so many female scientists that the fifth woman on the Society's list, the physicist Hertha Ayrton, felt able to tell a journalist: 'I do not agree with sex being brought into science at all. The idea of "woman and science" is completely irrelevant. Either a woman is a good scientist, or she is not.'³ Yet even now, 100 years later, relatively few women reach the upper echelons of career structures.

Many initiatives have been launched to understand and hence to address that gender imbalance. The Royal Society played a key role in establishing the Women in Science Research Network (WISRN), a project that brings together practising scientists, archivists and historians to explore women's participation in science since 1830, and to consider the prejudices inherited from the past. Analysing previous discrimination reveals

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how it still survives today; it may be concealed or unconscious, but being aware of its continued existence is essential if it is to be eradicated.

In multidisciplinary workshops and conferences organized by WISRnet—including several at the Royal Society—it became clear that extensive yet untapped sets of information exist in archives scattered throughout the country. If thoroughly investigated, these could substantially expand our knowledge of female participation in science. Although many of them are not an immediately obvious source for research into science's past, they can cast fascinating light on how enterprising women managed to engage in scientific activities when conventional routes were unavailable to them. Taking advantage of these rich but less self-evident resources entails thinking laterally rather than literally. Even towards the end of the twentieth century, there were substantially fewer professional female scientists than male ones; moreover, women's lives are often narrated from the perspective of their families rather than their careers. As a consequence, information about women's scientific involvement—especially those who did not study at university—is often concealed within discussions of their social activities.

Motivated by a WISRnet–Royal Society meeting at which archivists exchanged ideas about possibilities, I decided to consider the role of scientific women during World War I. Much has been written about the many thousands of previously unskilled women who worked in munitions factories, engineering or transport, and also about the enthusiastic young women who volunteered as nurses to escape the tedium of domestic servitude or sheltered middle-class gentility. I wanted to discover the far smaller number of women who had already graduated in science or had work experience. Some of them took over empty positions in museums, boys' schools and government departments, while those already engaged in research abandoned their current projects, and—like their male colleagues who remained behind—diverted their attention to military products and medical resources. Some female scientists and doctors volunteered to serve abroad, often in hospitals. Others attained high administrative positions, benefiting from the unusual experience of having worked professionally in one of the few environments where men and women could be equally well qualified, if not equally well recognized.

Often marginalized at the time, these women have been doubly excluded from the historical literature. Although since the 1970s increasing attention has been paid to women's activities during the war, scientists are so unusual compared with the many thousands of manual workers that they are rarely mentioned. At the same time, these women scarcely feature in books about science and medicine, which focus on men. Winston Churchill paid tribute to the pioneering Scottish doctor Elsie Inglis, who set up hospitals in Serbia, declaring that she and her female staff 'would shine forever in history', but the Edinburgh Hospital named in her honour no longer exists;⁴ in one recent scholarly account of Britain's medical war, women appear in only two contexts—a few brief references to nurses, and protests about British soldiers being allowed to enter French brothels.⁵

Many people believed—and still do—that the war represented a dramatic break with the past, liberating women by enabling them to work and giving the vote to those over thirty. 'The war revolutionized the industrial position of women', declared the founder of Newnham College and leading suffragist, Millicent Fawcett, in 1919; 'It found them serfs, and left them free.'⁶ In reality, only a tiny minority were enabled to act and think with anything even approaching the freedom of men, and even that liberation generally ended with the Armistice when old stereotypes were reinstated and men reclaimed their former jobs at a time of dwindling employment.

This article—based on a keynote address I gave at WISRnet’s two-day international conference, ‘Revealing lives: women in science 1830–2000’, held at the Royal Society—is designed to provide an overview of the scientific and medical contributions made by women during World War I. Mapping out the terrain, I sketch the stories of a few individual women but concentrate on formulating a background framework for contextualizing those who are revealed in the future. As just one example of a life waiting to be told, the Royal Society archives contain extensive correspondence about Mabel Purefoy FitzGerald, a physiologist who returned from America in 1915 to take a position in the laboratory of Edinburgh Infirmary that had become vacant because of the war.⁷

To assess the significance of these women, I begin by outlining the relationships between science and the suffrage movement, describing how traditional attitudes were reinforced by Darwinian theories of sex selection but modified when activists ceased protest and began to recruit wartime workers. In the next two sections I survey scientific activities first of women based at home—such as museum curators and research chemists—and then of those who served overseas with the military or as doctors. Finally, I summarize some general aspects of women’s situations after the war, illustrating how rapidly previous conventions were restored.

By writing this article, I hope to encourage detailed archival research into female scientists and doctors who took advantage of the war to demonstrate that they could not only take over the work of men but even do it better. Like their less-qualified contemporaries, once the soldiers came back these women found their opportunities restricted once again. Nevertheless, the entire nation had been indelibly altered. After the war, the government poured money into science, industry and education, and although all the old stereotypes re-emerged, there was now solid evidence that, when given the opportunity, women could prove themselves to be just as capable as men. That seems an important message to remember during the commemorations of World War I a century later.

SCIENCE AND SUFFRAGE

In the early twentieth century, modern women allied themselves with the new discoveries of science and technology. But at the same time, science was itself an agent of oppression. The status of women was based on centuries of prejudice, yet, ironically, existing assumptions about abilities and behaviour became reinforced by scientific beliefs. In particular, although suffragists tried to vindicate themselves by calling on evolutionary ideas, their opponents emphasized Charles Darwin’s pronouncements on the role of sexual selection, which strongly supported the notions of female intellectual inferiority and separate spheres of responsibility.⁸

Scientific and technological innovations were central to feminism. They affected how women behaved; conversely, attitudes towards women affected how inventions developed. For example, bicycles were initially unstable and impossible to ride in long, flowing skirts; in response to demands for safer machines, new devices—brakes, gears, air-filled tyres—made cycling easier and more comfortable for everyone. Once mocked as inappropriate, cycling became accepted as a healthy form of outdoor exercise, helping to give modern women the freedom and independence they needed for wartime work.⁹

Science was also changing women’s lives at home. Increasingly, commercial products were devised that claimed to enhance their lives and reduce their workload—carpet cleaners, ovens, lavatories, boilers, telephones, wind-up phonographs, processed food.

Some enterprising British women were patenting their own home improvements—hand-operated washing machines, two-part moulds for steaming puddings, piston-operated mustard pots, extendable beds, air-filtering roller blinds, telescopic window-cleaners.¹⁰ In practice, these inventions often resulted in more housework for many women, who were expected to justify their expensive purchases by serving elaborate meals and maintaining higher standards of cleanliness.

Similarly, although new machines did enable more women to gain employment, they also helped to keep them in low-paid, low-status jobs. Typewriters brought enormous advantages, but in the business world they were rapidly confined to the female domain. In the early twentieth century, many women preferred working in an office to cleaning someone else's floors, and by 1914 around 20% of clerical posts were occupied by women, who were willing to accept lower pay for the same work. Soon they were relegated to being second-class employees, the inferior assistants of men: instead of sorting laundry, they were now tidying up sloppy grammar and spelling. (This phenomenon repeated itself in the 1960s, when computerization was introduced. Although the new technology was in principle open to everyone, men became programmers—the prestigious intellectually demanding work—while women were exploited as punch-machine operators, mindlessly transferring data from handwritten sheets to cards and paper tape.)¹¹

Turning to science for theoretical support, suffragists argued that modern women represented a more highly evolved form of humanity than their predecessors. They regarded machinery as a liberating force that would enable woman to achieve her natural destiny of reaching higher levels through evolution. After all, since science and technology were changing the world so rapidly, surely women must also be improving? The so-called 'Bible of the Woman's Movement', Olive Schreiner's *Women and labour* (1911), proclaimed that 'from the chemist's laboratory to the astronomer's tower, there is no post or form of toil for which it is not our intention to fit ourselves . . . there is no fruit in the garden of knowledge it is not our determination to eat.'¹² Ayrton and other campaigning professionals marched behind embroidered banners depicting scientific figureheads such as Herschel, Mary Somerville, Marie Curie and Florence Nightingale.¹³

Deploying scientific vocabulary, the suffragist journal *Votes for Women* reported that 'the woman of political and social activity will be different from the domestic woman . . . just as palaeolithic man differs from his neolithic brother.'¹⁴ Cartoons lampooned opponents as social dinosaurs, inventing the imaginary 'Antysuffragyst or Prejudicidon', which was hampered by a tiny brain and sight so defective that it could not see past the end of its nose. But a single scientific argument could be multiply interpreted, and the small-brained Prejudicidons created scientific ammunition of their own for firing back. If they were dinosaurs, they retaliated, then the suffragists were degenerate creatures, defective and unwomanly.¹⁵

In *The Descent of Man* (1871), with its significant subtitle *Selection in Relation to Sex*, Charles Darwin had claimed that equality was scientifically impossible: lesser female brain power is an inescapable consequence of nature. Men are cleverer, he insisted, because over the millennia, their brains have become honed by chasing animals and defending their families. 'The chief distinction in the intellectual powers of the two sexes', wrote Darwin, 'is shown by man's attaining to a higher eminence in whatever he takes up, than can woman—whether requiring deep thought, reason, or imagination, or merely the use of the senses or the hands.'¹⁶ Although women everywhere were inferior, the problem was greater among the civilized races—at least, so ran the argument—because divergence between the

sexes had increased during evolution. Speaking in the House of Commons, an opponent of woman's suffrage quoted H. G. Wells:

An adult white woman differs far more from a white man than a negress or pigmy woman from her equivalent male. The education, the mental disposition of a white or Asiatic woman reeks of sex; her modesty, her decorum, is not to ignore sex but to refine and put a point to it; her costume is clamorous with the distinctive elements of her form.¹⁷

Such scientific justifications for denying women the vote were backed up by medical theories. For centuries, women's supposedly erratic behaviour had been attributed to their reproductive systems, and from around the middle of the nineteenth century, medical attention shifted from the uterus to the ovaries. Seen as the counterpart to the male testes, they were held responsible for feminine characteristics and were thought to be controlled physiologically through the nervous system. Although research into hormones had started by the time of the war, it was not until the 1920s that the role of chemicals in the body was seen as crucial by doctors. In any case, most people knew nothing of the latest research: physiological and sexual ignorance prevailed, which was why the basic instruction manual *Married love*, published by the palaeobotanist Marie Stopes in 1918, proved so successful.

When militants' demonstrations turned violent, it became easy for physicians to diagnose the problem as a medical one that had its masculine counterpart. Making bodies sound like heat engines, men were warned not to masturbate because they would be weakened by excessive loss of semen. Correspondingly, doctors maintained that for women, lack of sexual activity led to surplus energy being released through unfeminine aggression. The distinguished bacteriologist Sir Almoh Wright used the weight of his medical reputation to provide an explanation of female deviance couched in scientific terms. When 'the doctor lets his eyes rest on the militant suffragist,' he wrote to *The Times*, 'he cannot conceal from himself the physiological emergencies which lie behind her mental disorder. . . . These are the sexually embittered women in whom everything has turned into gall and bitterness of heart, and hatred of men.'¹⁸

Scientific arguments were also used to explain why women belonged at home rather than in a laboratory. Evolutionary science provided no guarantee of continued improvement, and for years Francis Galton (Darwin's cousin) and other advocates of positive eugenics had used the vocabulary of animal husbandry to warn that if women of pedigree abandoned their nurturing roles as mothers, the nation's stock would decline. Maintaining the quality of the population demanded that genteel folk should breed as rapidly as the feckless lower classes: it was the duty of intelligent girls to rear clever boys and domesticated daughters, not to indulge themselves by studying science or earning money. Concerns that the British race might be deteriorating were inflamed in the early years of the twentieth century by statistical evidence: army doctors declared that around half the recruits were unfit to fight, the number of mentally disabled people seemed to be increasing, and the birth rate was plummeting. During the war, money was allocated for maternal health care to ensure that the next generation of soldiers would be healthy enough to fight and retain Britain's natural place as world leader.

The suffragist response to the war succeeded in temporarily shifting opinions where violence and marches had failed. Only two days after hostilities were declared, the National Union of Women's Suffrage Societies (NUWSS) transformed themselves from perceived enemies of the establishment into a patriotic support movement mobilizing a

female work force. They set up the Women's Service Bureau in Victoria Street, hiring a large staff of interviewers to place many thousands of women a year into a wide range of technical and engineering positions as munitions workers, plumbers and fitters. By 1916 the NUWSS had convinced the nation that women's industrial contributions were invaluable: the Minister of Munitions told the House of Commons, 'it is not too much to say that our Armies have been saved and victory assured by the women in the munition factories where they helped to produce aeroplanes, howitzer bombs, shrapnel bullets, shells, machine tools, mines, and have taken part in shipbuilding.'¹⁹

Despite this new appreciation of their technical skills, women were still regarded as inferior. Supposedly justified by science, this view prevailed among men and women alike; even outwardly successful women managed to reconcile their daily activities with their belief in male superiority. In the seminal feminist text of the early twentieth century, *A room of one's own* (1929), Virginia Woolf insisted on the essential differences between male and female creativity. Rather than arguing for today's ideals of equal participation in a shared environment, she recommended separate spheres: in the utopian research laboratory she imagined, only women are busy.²⁰

In real-life factories, women working in the munitions factories—soon nicknamed munitionettes—were forced to confront the scepticism of existing employees when their masculine work-space was invaded. 'Engineering mankind is possessed of the unshakeable opinion that no woman can have the mechanical sense', complained one inexperienced but resourceful young woman.

If one of us ask humbly why such and such an alteration is not made to prevent this or that drawback to a machine she is told with a superior smile that a man has worked the machine for before her for years and therefore that if there were any improvement possible it would have been made. As long as we do exactly what we are told and do not attempt to use our brains we give entire satisfaction and are treated as nice good children.²¹

At all levels, scientific women were paid less than men and given comparatively menial tasks. Almost 90% of industrial chemists during the war were women, yet they were allocated tedious and repetitive tasks deemed suitable for those used to following a recipe. Nevertheless, munitions work was also extremely dangerous. In addition to the hazard of accidental explosions, poisonous chemicals damaged the women's health. At the 10-mile-long complex in Gretna for synthesizing cordite, the women were known as 'canaries', because their hair went green and 'our skin was perfectly yellow, right down through the body, legs and toenails even, perfectly yellow'.²²

While male university students were dying at the Front, their female peers were being treated like children. '[P]erhaps the most thrilling event of the term from the feminine point of view has been the appeal for women munitions-makers', wrote one;

After twenty-four distracted and heart-searching hours; after some of us had obtained permission to go and were feeling heroic... and after some of us had defied our obdurate parents and guardians in the names of Patriotism and Legal Majority... we were informed that our highest patriotic duty was to complete our education.²³

Presumably many women shared the fate of Vera Brittain, summoned home from France as though her war work were unimportant compared with her duties as a daughter.

For many of these industrial women, the liberating effects of the war were limited and temporary. After peace was declared, unemployment levels rose, and married mothers agreed with the conventional view that men should have priority, especially as their wages were higher for the same work. Sheffield University had run special training courses for female metal-workers, but local steel companies reported laying off this technically skilled work force: 'On the signing of the Armistice most of the women were replaced by returning soldiers'.²⁴

INSIDERS AND OUTSIDERS

Discrimination also prevailed among academic scientists. 'They do not go to Professor Ramsay', Lord Haldane was informed about students at the all-woman Bedford College; 'He does not encourage women to work with him particularly. I think I am not misstating the fact that he rather discourages women in his laboratory for research purposes.'²⁵ One problem was the lack of opportunities for informal discussions between men and women. As Stopes, a former University Lecturer in palaeobotany, protested in 1914, 'Women high up in scientific positions, women with international reputations... are shut out from the concourse of their intellectual fellows.'²⁶ At University College London the women eventually secured a tea room of a reasonable size (a former chemistry laboratory, with a gas burner in the stink-cupboard), but when one of them was invited into the men's common room there was 'such a sanacker-towzer of a row that even [her male ally] quailed, and a feminist invasion was averted!'²⁷ In contrast, a few individual scientists—especially in new fields, such as genetics and X-ray crystallography—were very supportive and welcomed women to join their teams. They were, perhaps, astute enough to recognize that female researchers who had reached such an advanced level must have been of an exceptionally high calibre; they could also be employed more cheaply than men to perform the same work.²⁸

For women outside universities or other formal institutions, the absence of contact networks was felt still more strongly, especially as most scientific societies still did not accept women.²⁹ Although working in different countries, Hertha Ayrton and Marie Curie became close friends, both of them scientific wives of scientific husbands, both of them isolated as women in an overwhelmingly male environment. Ayrton won a Royal Society medal for her innovations in electric street lighting, but she was denied a Fellowship and became increasingly marginalized after the death of her physicist spouse. When she extended her previous research by designing a wooden fan to protect soldiers against gas attacks, the War Office resisted taking her proposals seriously.³⁰

The war gave some female scientists an opportunity to do more stimulating work, albeit behind the scenes and with low remuneration. For example, at London's Natural History Museum, more than 20 men had left by the end of 1914, and women such as the palaeontologist Dorothea Bate were given greater responsibilities. Like her fellow worker Annie Smith, a distinguished mycologist who had already served as President of the British Mycological Society and was a leading expert on lichens, Bate was ineligible for an official staff position, so she was enrolled for 37 years as a temporary unofficial scientific worker. Although her workload steadily increased as more men disappeared to the Front, she was paid piece work, earning less than male assistants who were permanently employed but less skilled. At the beginning of 1916 the government tried to

reduce its expenses by closing all museums, but public outrage expressed through the press forced a relaxation and some galleries stayed open, often run by women. Even after the war, the pressure of work remained high because of the backlog of uncatalogued specimens, but it was not until 1928 that women were at last permitted to apply for jobs—although the advertised salaries were too low to attract men.³¹

Similarly, the war gave university women the opportunity to perform stimulating and responsible work, but at lower levels of remuneration than men. Although the government introduced a bonus pay scheme for all staff in 1917, women were only awarded two-thirds of the amount for men. Many university women worked for nothing. 'I was one of the workers in the preparation of diethylamine some weeks ago and should be glad to hear of any further help I could give', wrote Margaret Turner, a pharmacologist from the University College of Wales; 'I can put all my time and energy at your service for the next 6 weeks, and am anxious to know whether the few helpers down here, could not be allowed to contribute further to the needs of the country? . . . I, for one, am willing and eager to give up all ideas of holiday while there remains so much to be done.'³²

Women played key roles in the wartime scientific research projects initiated and partly funded by the universities. A government appeal went out for new inventions, but very few of them—electrical death rays, magnetic devices for catching Zeppelins—seemed feasible. Instead, scientists concentrated on improving previous weapons and equipment by coordinating efforts to conduct research and build factories. The new redbrick universities responded rapidly, demonstrating their national importance by matching their research programmes to military requirements, and by necessity drafting in women to replace men who had signed up. As just a few examples, Birmingham chemists collaborated with Lever Brothers to develop a powerful tear gas that could penetrate the filters in German masks; two of Ernest Rutherford's Manchester students performed sound experiments to improve submarine detectors; Bristol pathologists investigated industrial fatigue in the munitions factories; London chemists devised a more effective filling for bombs and grenades; and gas weapons were tested in the gardens of Imperial College.

Because male scientists were serving abroad, this wartime research created opportunities for women to undertake more responsible, interesting work than previously. Some of them benefited by being permanently propelled into scientific eminence, although details are hard to glean. For 13 years the chemist Frances Micklethwait had pursued a back-room career, but in 1914 she joined the South Kensington team making explosives and was awarded an MBE for her top secret work.³³ Phylis McKie had still been an undergraduate when the war started but she was awarded an MSc on the basis of her wartime research, and subsequently pursued a distinguished academic career in chemistry.³⁴

Imperial College was particularly heavily involved in wartime activities. Several buildings were taken over by military administrators; scientists had to step over sleeping soldiers in the morning, and museum cases were used as dining tables. Unprecedentedly high numbers of women were involved. The Royal Flying Corps drawing office was staffed by 20 men and 30 women; the college housed the Women's Emergency Corps; female scientists were left in charge of research projects; and women took over lecturing to audiences with a higher proportion of female students than usual (who in the vacations went off to work on farms with the Land Army). Miss Lodge and Miss Jackson supervised the fly room for developing insecticides, and in the experimental trenches they dug in the gardens; Martha Whiteley and seven female assistants tested explosives and poisonous gases: one product was codenamed DW for Dr Whiteley.³⁵ Heavily involved in

feminist politics, in 1920 Whiteley was among the first women to join the London Chemical Society.³⁶ More than 30 years later, in a lecture designed to inspire young women, she described how she had examined the first sample of mustard gas to be brought back to London. 'I naturally tested this property by applying a tiny smear to my arm and for nearly three months suffered great discomfort from the widespread open wound it caused in the bend of the elbow, and of which I still carry the scar.'³⁷

Concealed from view, the contributions of these women were and continue to be insufficiently acknowledged. Tucked away in the archives of the Royal Society is a letter sent from a male chemist at St Andrews University to the War Committee in 1919. Reporting on the sacrifices made by his female colleagues researching into synthetic drugs, explosives and poisonous gases, it describes the continuous high demand for their work, performed without government support. As a consequence, 'the workers who remained with me gave up many opportunities for professional advancement. I mention these facts as an index of public spirit with which these women gave their services, services which have not received any public recognition.'³⁸

ACTION OVERSEAS

Especially at the beginning of the war, the view prevailed that women were unsuitable for action overseas: their role was to keep the home fires burning. The NUWSS immediately raised funds to send female medical units abroad, but they had to fight against official discrimination, incompetence and procrastination.³⁹ As the war continued, resistance to offers of help decreased, and women of all classes and educational backgrounds managed to travel abroad, often for the first time. The two main areas providing opportunities were the armed forces and medicine.

Two scientific women were temporarily diverted from their careers to head the Women's Auxiliary Army Corps (WAAC), which was set up only in 1917. The home-based officer in charge was Mary Geddes, the first woman to graduate in medicine from the University of Edinburgh; she invited Helen Gwynne-Vaughan, Head of the Department of Botany at Birkbeck College, to oversee WAAC operations in France. Initially surprised, Gwynne-Vaughan later commented that female scientists were unusually well qualified for military work, because they had experience of 'perhaps the only sphere in which at that time young men and women worked freely together—the laboratories of a modern university.'⁴⁰ The laboratory was a secluded space with its own conventions, where female identity was left behind at the door to the outside world. 'We have no airs and graces here', announced Ann Veronica, H. G. Wells's fictional scientific suffragist, as she clicked shut her microscope case; 'my hat hangs from a peg in the passage.'⁴¹

Male resistance to women's involvement in war work was enormous. Even the first nursing volunteers in France had been greeted dismissively: 'women were such a nuisance in war time and who were these odd women in uniform, anyway?'⁴² But by the end of the war, around 60000 women had served in the armed forces, deployed mostly as cheap labour in routine jobs such as cooking and cleaning.⁴³ Gwynne-Vaughan felt she had crossed the English Channel 'into a new and different world', and she immediately set about changing it by insisting that the women should be treated exactly the same as the men. On top of countless confrontations over uniforms, duties and privileges, she had to persuade her colleagues that jokes such as 'Would you rather have a slap in the eye or

a waac on the knee?’ would not be tolerated. After subsequently running the Women’s Royal Air Force for a year, Gwynne-Vaughan returned to Birkbeck laden with national honours but keen to resume her research into fungal genetics, of great practical significance when refrigerators were scarce and transport was slow.⁴⁴

The war generated new opportunities for women to engage in medical work. During training they ‘had this drilled into us: you not only have to do a good job but you have to do a superior job. What would be accepted from a man will not be accepted from a woman. You have got to do better.’⁴⁵ Like Lise Meitner and Marie Curie, some scientific women volunteered as radiologists. Jesse Slater, for example, had worked on radioactivity at the Cavendish Laboratory before returning to Newnham as a physics lecturer. During the war she obtained leave to work as a part-time nurse, and then became a full-time radiographer at British Military Hospitals in France. After the war she resumed her position at Newnham.⁴⁶ But discrimination persisted: when the research botanist Edith Stoney was appointed Head Radiologist in Salonika, the War Office withdrew permission for a woman to hold the post. Perhaps they would have changed their mind if they had known that 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’.⁴⁷

There were few British training opportunities for female doctors before the war, but as demand grew, new medical faculties opened at King’s College and elsewhere.⁴⁸ Of those already qualified, the most prominent campaigner was Elsie Inglis, the Scottish doctor subsequently celebrated by Churchill. An active campaigner for women’s rights, she took advantage of the well-established suffragist network to appeal for funds and volunteers. Within only two weeks, she had offered the War Office a fully equipped and staffed hospital but was told to ‘go home and keep still’: the commanding officers ‘did not want to be troubled with hysterical women.’⁴⁹ In contrast, Britain’s allies—Belgium, Russia, France—accepted eagerly, and the first unit headed off for Serbia in December 1914.

Inglis served in Serbia and also in Russia, treating wounded soldiers and introducing hygienic measures to limit typhus epidemics. After being captured and repatriated, she returned to the field and died of cancer in 1916, but her initiative expanded and continued. Female units remained in Salonika throughout the war, surviving extremes of hot summers and cold winters. Some of them died, from infectious diseases, the harsh environment or enemy bullets. The major threats were malaria and dysentery, and they took preventive measures such as boiling and chlorinating water, draining marshes, pouring petrol over lakes, and collaborating with the French in launching public health campaigns. Thanks to the women’s organizations, they had well-kitted laboratories and performed original research into tropical diseases. Armistice Day passed virtually unnoticed as they struggled to contain locally the flu pandemic that killed 3–5% of the world’s population, and many Scottish women remained in the area until March 1920, when their units were disbanded.

Either too busy or too modest to write about themselves, these women are now little remembered.⁵⁰ One exception is Isabel Emslie Hutton, an Edinburgh doctor who had formerly worked with children and in a mental hospital, and who later described in detail her Serbian experiences. Memoirs are notoriously unreliable, but the experiences she endured were clearly appalling. The women created hospitals from scratch, erecting tents for the wards, building stone incinerators and digging latrines—all in freezing weather

conditions.⁵¹ After taking command of an American unit, she arrived in Vranja to discover that the ‘operating room was a ghastly sight, the floor swimming in blood, and pails crammed with arms and legs black with flies lay around the old deal table on which they had been amputated.’⁵² Even once an efficient field hospital had been set up, typhus spread among medical staff as well as patients.

For this period of their lives, these self-motivated women enjoyed great freedom and excitement but also responsibility. In contrast, the Army was slow to recognize the value of female doctors, repeatedly denying them the same pay and conditions as the men; in particular, not being allowed to wear uniforms or to be promoted above a certain level made it difficult for them to maintain discipline.⁵³ ‘What a rotten position these women have,’ Hutton reported about a middle-aged military doctor in Salonika; ‘She’s got no rank & [is] junior to the most junior male doctors.’⁵⁴ This official discrimination continued: until World War II, women doctors were not eligible for a commissioned rank in the British Army.

POSTWAR REALITIES

This article has broken new ground by casting a spotlight on the small number of women who entered the war with relatively high levels of scientific or medical knowledge. Although many of them were performing similar work to that of their male colleagues, and under equally exacting conditions, their contributions were under-recognized at the time and have since been eclipsed. Soon after the war was over, many of them shared the same experiences of demotion and rejection as the less-qualified women who had performed more routine technical and industrial work in conventionally male areas. Often justified by calling on science, prewar stereotypes reappeared, so that in practical terms it seemed that the war had made little difference to the status of women. The feminist journalist Cicely Hamilton had gone out to the Front to entertain the troops, but by 1935 she was lamenting that

the battle we had thought won is going badly against us—we are retreating where once we advanced; in the eyes of certain modern statesmen women are not personalities—they are reproductive faculty personified. Which means that they are back at secondary existence, counting only as ‘normal’ as wives and mothers of sons.⁵⁵

When it gave the vote to women more than 30 years of age in 1918, the government seemed to be recognizing their ability to participate in running the country. Suffragists naturally claimed much of the credit, but this was a somewhat hollow victory. By restricting the vote to those over 30, they were effectively disempowering younger women who had experienced work as chemists, electricians and welders and now wanted to retain their wartime freedom and independence. In contrast, as unemployment rose, married women with families—those with the vote—were concerned that priority should be given to their menfolk, who earned more money for the same work. Across the social spectrum, many patriotic women had adopted uniforms to indicate their official status and symbolize their dedication to duty, modernity and independence. Despite the value of their labour, they were often mocked for flouting conventions and accused of provocatively modifying their official clothes to achieve their true goal of sexual encounters. Once the war was over, resentment resurfaced: ‘to be frank,’ pronounced *The Times*, ‘the public has grown tired of uniformed women.’⁵⁶

Government and industry provided greater funding for science after the war, but men benefited more than women, who were given less skilled jobs at lower pay. As a disillusioned interwar drugs researcher explained:

the male graduate . . . is paid a reasonable salary and, however young, if his university qualifications are good, he is usually given quite a dignified position from the beginning. The girl who worked side by side with him at the university is hard up and constantly humiliated. . . . She will be happier if she is not too enterprising because then her sense of frustration will be less.⁵⁷

The situation in medicine was similar. When Hutton and her female colleagues returned to Britain, their new-found independence dwindled. The traditional masculine culture once more prevailed in the medical schools, which again closed their doors to women.⁵⁸ Although Hutton had started the war with limited surgical experience, she had been forced to undertake many tricky operations and had also treated burns, congenital deformities, vast tumours and other conditions that in Britain would have been dealt with far earlier. Despite having acquired great expertise under atrocious conditions, Hutton ‘knew that it would have been unwise and unprofitable to make surgery my life’s work at Home.’⁵⁹ Reluctantly, she abandoned any prospect of permanently entering this male-dominated speciality.

Prejudiced attitudes of 100 years ago still affect how the war is remembered today. Easily the two most famous British women of the war—Edith Cavell and Vera Brittain—were both middle-class nurses who conformed to traditional ideals of femininity by nurturing men and sacrificing themselves. In contrast, Whiteley, Hutton, Gwynne-Vaughan and their forgotten colleagues displayed unconventional independence, intellectual acumen and leadership ability, qualities that also merit celebration.⁶⁰

‘The idea of “woman and science” is completely irrelevant’, Ayrton declared; ‘Either a woman is a good scientist, or she is not.’⁶¹ Are her words any truer now than they were then? More than 100 years have gone by since she was refused membership of the Royal Society on the grounds that she was married. Under modern gender legislation, such overt discrimination would be impossible. But although equality of opportunity is now firmly entrenched, the problem of unequal numbers remains unresolved, especially at higher levels. Glass ceilings and leaky pipelines still present tough challenges for ambitious women in science.

NOTES

- 1 The Royal Society, ‘Most influential British women in the history of science selected by panel of female Fellows of the Royal Society and science historians’ (21 March 2010). See <https://royalsociety.org/news/2010/influential-british-women/> (accessed 5 Jun 2014).
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- 13 Many suffragette banners are preserved in collections at the Fawcett Library and the Museum of London. Tickner, *op. cit.* (note 8), pp. 67–69; C. G. Jones, *Femininity, mathematics and science, 1880–1914*, pp. 91–93 (Macmillan Palgrave, London, 2009).
- 14 Jean Finot (1911), quoted in Tickner, *op. cit.* (note 8), p. 182.
- 15 Cartoon, *Vote*, 26 September 1919, reproduced in Tickner, *op. cit.* (note 8), p. 189.
- 16 Richards, *op. cit.* (note 8), *Descent of Man* quoted on p. 119.
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- 19 Kent, *op. cit.* (note 17), p. 284.
- 20 V. Woolf, *A room of one's own*, p. 84 (Penguin, Harmondsworth, 1945); L. A. Hall, 'Chloe, Olivia, Isabel, Letitia, Harriette, Honor and many more: women in medicine and biomedical science, 1914–1945', in *This working-day world: women's lives and culture(s) in Britain 1914–1945* (ed. S. Oldfield), pp. 192–202 (Taylor & Francis, London, 1994), esp. p. 192.
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- 61 See note 3.