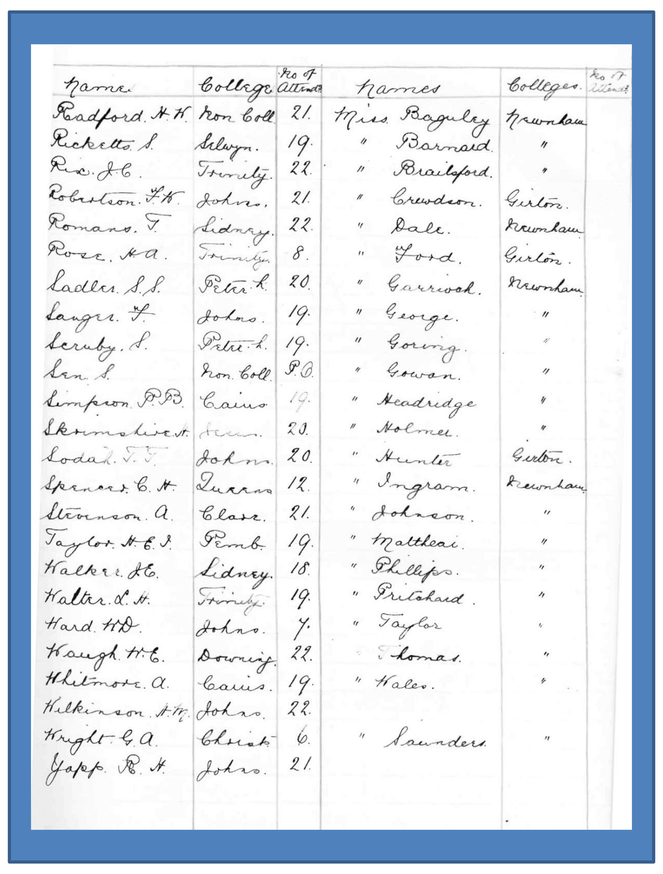
'Careers' for women scientists in the late C19 & early C20

A revolution in the teaching of science
In the 1870s, Thomas Huxley changed the way science was taught in Britain when he had students perform experiments to verify what they had been taught in his lectures. Three of Huxley's Demonstrators in turn influenced science teaching at Cambridge : Michael Foster [Physiology], Francis Balfour [Morphology] and Sidney H Vines [Botany]. Foster in particular energised the Natural Sciences, establishing a 'Cambridge Biological School', with Physiology, Botany and Zoology afforded equal prime importance. These modernised subjects proved attractive to students - which soon caused problems. It was sometimes difficult to accommodate greater numbers in lecture rooms, let alone in laboratories. Middle-class women aspired to a Cambridge education for the same reasons men did, even though, whilst other universities awarded them degrees, Cambridge did not.

State-of-the art Elementary Lab in the entirely new Botany Building in 1904. Botany was a subject commonly chosen by women at Cambridge – yet there is no space for them here



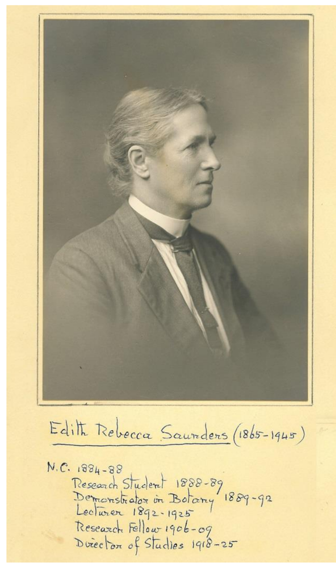
Name	College	No of Attend	Names	Colleges	No of Attend
Radford H.H.	Non Coll	21	Miss Bagulay	Newnham	
Ricketts S.	Selwyn	19	" Barnard	"	
Rix J.C.	Trinity	22	" Brailsford	"	
Robertson F.W.	Johns	21	" Crewdson	Girton	
Romans T.	Sidney	22	" Dale	Newnham	
Rose H.A.	Trinity	8	" Ford	Girton	
Sadler S.S.	Peter h.	20	" Garrood	Newnham	
Sanger F.	Johns	19	" George	"	
Scruby S.	Peter h.	19	" Goring	"	
Sen S.	Non Coll	P.O.	" Gowan	"	
Simpson P.B.	Caius	19	" Headridge	"	
Skrimshire H.	[illegible]	23	" Holmes	"	
[illegible] T.T.	Johns	20	" Hunter	Girton	
Spencer C.H.	Queens	12	" Ingram	Newnham	
Stevenson A.	Clare	21	" Johnson	"	
Taylor H.E.J.	Pemb	19	" Mattheai	"	
Walker J.C.	Sidney	18	" Phillips	"	
Walter C.H.	Trinity	19	" Pritchard	"	
Ward H.D.	Johns	7	" Taylor	"	
Waugh H.C.	Downing	22	" Thomas	"	
Whitmore A.	Caius	19	" Wales	"	
Wilkinson H.W.	Johns	22			
Wright G.A.	Christ	6	" Saunders	"	
Yapp R.H.	Johns	21			

The register for Prof Marshall Ward's Botany lectures in Michaelmas Term 1896 lists 'Saunders' at the end, after the other women. This no doubt indicates she was required to attend as a chaperone. Whilst the men's attendance is recorded, it was not considered important to do so for women. When women's attendance was also recorded later on, it is evident they bothered to attend lectures more frequently than men

Teaching women science at Cambridge From 1870, Cambridge provided Lectures for Ladies on a limited range of subjects. The students of Newnham and Girton soon demanded more - an education at an equal level as that for men. Admitting women to classes was left entirely to the discretion of individual lecturers, so provision was patchy and unpredictable, with admissions one year possibly being revoked the next. Some sympathetic male lecturers travelled to the women's colleges to teach, since until adequately-trained women passed through university, there were none qualified to lecture. Women came to be allowed into some University classes not because of generally increasing acceptance, but because it was inconvenient for male lecturers to teach separate courses in the somewhat distant women's colleges. Even when women were admitted to University lectures, there were sometimes complaints that the content had to be changed to make it acceptable and comprehensible to women. They were required to enter separately, sit separately [in a gallery where possible], and be chaperoned. If they asked questions, or even took notes, they were ridiculed. Women naturally chose subjects where a decent range of lectures was open to them. The popularity of Physiology was mainly due to Michael Foster's inspiring lectures and innovative teaching - But he also happened to admit women. Edith Saunders was one of his students.

Women were officially allowed to sit Tripos exams after 1881. But however good their results, they were not awarded Degrees, only certificates of completion. Degrees for Women Memorials were rejected by the Senate in 1887, 1897, and even as late as 1921.
In 1888, Edith Saunders attained the level of a First Class Degree for her Part II exams, and because of her high grade, the subject was listed in the Reporter: It will be surprising to many who know her as a botanist to discover that her subject was in fact Physiology. She never had a degree: She could have applied retrospectively in 1921, but through pride declined.

Edith Saunders is not being celebrated as a member of the Department of Genetics. She was never a member of any department at Cambridge - Because she was a woman. Furthermore, despite her influential and nominally high-level position in women's education - as Lecturer, Director of Studies, and Fellow of Newnham, she never had the status of a University Lecturer. She undoubtedly achieved greater recognition outside Cambridge than within. The highest status she attained as a University employee was as a Demonstrator in the Dept of Botany 1918-27. Harold Godwin undertook her Practicals as an Undergrad 1919-22, then was immediately employed as a Junior Demonstrator under her. By Michaelmas 1926 he was lecturing on Elementary Plant Biology – with Saunders as one of 'his' Demonstrators. Born 15 years after Saunders, Muriel Wheldale/Onslow became one of the first group of women to be appointed University Lecturers. In this case, in 1926 Saunders found herself Demonstrating for a woman who in 1906-8 had assisted her in the Balfour Lab.



Life after University
As if women did not face enough barriers as university students in the late C19 and early C20, worse was to come once they had completed their education. Science was becoming more professionalised and more research-based, which excluded women on both counts. The certificate women were awarded from Cambridge was by the implication of its name of lesser value than a degree. However talented or motivated they might be, generally women's only viable career option after university was to teach – in girls' schools. For a woman to become a research scientist was almost impossible. A male colleague of Marion Greenwood describes their experience:

'At that time women were rare in scientific laboratories and their presence by no means generally acceptable – indeed that is too mild a phrase … unacceptability not infrequently flamed into hostility. The woman student was rather expected to be eccentric in dress and behaviour; she was still unplaced as far as the male in possession was concerned' ['WBH' ie William Bate Hardy]

A very few women who passed through the Cambridge system were able to secure teaching posts connected to [but not part of] the University. These were funded by the two women's colleges Newnham and Girton - ergo understandably rare. Edith Saunders, although clearly an outstanding student, was very lucky to have been among the earliest female students considered qualified to teach science, thus securing a Newnham teaching post after a year's funded research. In 1883-4 there were only 10 teaching positions across all subjects in the 2 women's colleges, though by 1893/4 this had increased to 23. Moreover, careers advice at the time warned 'These are not well paid and are chiefly attractive for the pleasant university life they afford'. A Newnham lecturer was paid £100 pa, whilst a male College Fellow could earn £500 pa. Without the entailed board and lodging it would have been hard to manage on that salary.

Funding for long-term independent research by women simply was not available. If women hoped for a research career, their only viable opportunity was to assist an amenable male scientist with sufficient funding [unless they were independently rich like Ethel Sargant]. A few – still relatively lucky to have been employed in science at all – performed low paid and uninspiring jobs men would not consider taking. Whilst Newnham women were recruited by Edith Saunders to assist William Bateson, some Girton women undertook background tasks for the biometricians. Yet women must have believed change would surely come soon – In 1903, Marie Curie was a joint recipient of the Nobel Prize with her husband Pierre for their research on radium.

Only a few of Edith Saunders' near contemporaries managed to embark on a career in science, and far fewer continued for many years. Many talented women were forced to give up their careers when they married, whilst others lost their tenuous positions if the circumstances of the man they assisted changed. Once Francis Darwin retired, published scientist Dorothea Pertz only retained her connection with the Botany Department by laboriously indexing German scientific periodicals for the benefit of other researchers [and for which F F Blackman often gets the credit] Igerna Sollas assisted Bateson at Cambridge, but as she was working on coat colour of guinea pigs and wing colour in butterflies, he could not employ her at the John Innes Institute. She gave up science for Christian Science, and became her father's housekeeper..

Opportunities for women in Genetics
The emerging science of Genetics afforded rare opportunities for women to engage in scientific research. Without the validation of University recognition, funding was difficult to secure, and so it was unattractive to male graduates seeking a salary and tenure. Whilst at Cambridge, Bateson was required to conduct research with occasional small but hard-won grants of perhaps £50 from bodies such as the Royal Society, or arranged through supporters such as Francis Darwin.

Bateson considered recruiting horticulturalists for plant breeding experiments but recognised they did not have the requisite scientific background. Keen observation and meticulous and consistent recording of a very large number of breeding experiments across a wide range of species was necessary in order for the results to be accepted by other scientists. This day-to-day recording was by no means an exciting job, but Bateson's 'virile personality' and 'genius' [Punnett's opinion] convinced several women that their support of his research was vital in this exciting new field, even if unpaid. Women came cheap/free, but women also came keen – they had achieved good results in Tripos exams, yet could still find no employment to utilise their skills and intellect. Bateson, as a well-known campaigner for degrees for women, at the least represented some possibility of advancement and a salary in future. Between 1900, when he rediscovered Mendel's principles, and 1910, when he left Cambridge, Bateson worked with 13 assistants, 7 of which were Newnham women. He was able to employ several women at the John Innes Inst, and even established research scholarships there for specific talented women.

Matildas* in the shadows
It will always be difficult to measure women's contribution to science in the late C19 and early C20 because the input of many of them was not documented. Almost all were assistants, many of those were unpaid, some were relatives or wives. For example, Bateson's wife Beatrice juggled childcare with 'recording and the many menial operations' – Clerking, raising chickens and caring for plants in their garden at Grantchester, and careful and consistent recording of the physical characteristics and sex of chicks. Her duties carried on even when Bateson went on trips or on vacation - by himself. Her assistance was publicly unacknowledged, yet Punnett was initially recruited to perform the duties she had undertaken. As a male scientist, Bateson was exceptional : He referenced experiments conducted by female assistants in his writing and speeches, and took them with him to conferences. But as a rule, women scientists learned to be self-effacing of necessity. Edith Saunders, though a scientist in her own right, and regarded by many as a particularly strong woman, was always modest:

'She was essentially humble-minded and never sought recognition for herself, though she was a bonny fighter in genetic controversy' [E M Chrystal]

* The 'Matilda Effect' is science historian Margaret Rossiter's term for the 'invisibility' of women scientists, just as 'Matthew' is the term for male scientists whose contribution is overlooked because of their more famous colleagues

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Research + Poster = Christine Alexander