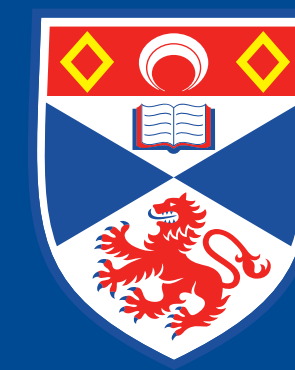


International Stars - The Work and Legacy of Female Computers in Edinburgh and Perth, Western Australia

Joseph Luke, *University of St Andrews*



University of
St Andrews



A female computer working at Melbourne Observatory, c.1905. (Supplied: Museums Victoria)

Ordinary women are often not acknowledged for their contributions to scientific achievement. Historically, if a woman's work is recognised, she is almost always described as a 'trailblazer'. This trend in the history of science, where progress is viewed almost exclusively in the light of the solitary genius, excludes the everyday women of astronomy. Very rarely are they or their vital calculations and measurements recognised. There is no better example of such forgotten women than the female computers employed on the Astrographic Catalogue.



Above: Edinburgh Measurers c.1911 (Photo courtesy of Royal Observatory, Edinburgh)



Left: Staff of Perth Observatory, 1910 (Sunday Times, Perth, May 1st 1910)
Women are now considered 'staff'.

The Astrographic Catalogue

In 1887, at the suggestion of brothers Paul and Prosper Henry, an international congress of astronomers was held in Paris by Paris Observatory director Amédée Mouchez. This was done largely because of the development of a new dry plate photographic process, which was recognised by the Henry brothers and Mouchez as a method which could be used to create a more accurate mapping of the stars than had ever been previously attempted.

The Astrographic Congress hosted more than fifty astronomers, and ultimately twenty observatories pledged themselves to two major projects, to be completed concurrently. These were the Astrographic Catalogue (AC), and the Carte du Ciel (CdC). Whilst the CdC was the original project, it was never finished, and over time the AC came to be the main focus for most of the observatories involved. In particular, it was the AC which would lead to the first paid positions in astronomy for women in the UK and Australia. Thus, we will focus here on the AC, but we should note that the AC/CdC are widely confused.

The goal of the AC was to photograph the entire sky in order to provide a reference catalogue – this would provide the positions of a visually dense network of star positions which could in turn be used as a reference system for the fainter survey component (the CdC). These photographs were taken with the help of a standardised Astrographic Telescope, and recorded onto astrographic plates. The plates, of typically 6 minutes exposure, were then measured at the observatories, not at a central bureau in Paris as originally planned in the first Congress. This decision was made in later meetings, and was a conscious decision which resulted in the normative hiring of female computers.

Different observatories around the world were charged with surveying specific declination zones. In particular, Perth Observatory was originally allocated the zones from -32° to -40° . However, due to the greater star density for this section of sky, and the low level of funding and certainty

which was provided by the colonial government in Western Australia, the Royal Observatory, Edinburgh, was asked to assist with the measuring of plates for the zones -38° to -40° . This was agreed to by then Astronomer Royal for Scotland, Sir Frank Watson Dyson.

The main difficulty faced in the creation of the Astrographic Catalogue was the slowness of most observatories in measuring, calculating and printing the tables of star positions. The project was first envisaged to complete c.1915 - the final set of publications were not finished until 1964. This was due to both the sheer scale of the project, faulty communication between colonial observatories, and lack of funding. As a result, the important legacy of the work done has been overlooked until very recently.

"The value of the Astrographic Catalogue may be taken as unquestionable. It was an immense cooperative undertaking... This occupied my workers many years."

- R.A. Sampson, DSc, FRS [1]

Female Computers in Edinburgh

On June 1st 1909, two women began work at the Royal Observatory, Edinburgh (ROE). While not the first to work at an observatory in the UK, they would be the first women employed in any permanent capacity at the ROE, working on the AC as star measurers.

At least eighteen different 'female computers', as they were referred to in official reports, were employed on the project from 1909 into the 1930's (and possibly beyond). Their work consisted largely of measuring star positions on the astrographic plates. This was done in pairs, working with a special measuring device, which can be seen in the image to the left. One woman would measure while the other wrote the measurements into pre-prepared tables - switching frequently to avoid eye-strain.

"... the computing required has usually been performed by two ladies working part time and I regard this as a suitable and economical method."

- R.A. Sampson, DSc, FRS [2]

They were also later responsible for calculating the right ascension and declination of each star. The computers did not require special training or testing, unlike male assistants in UK observatories, who had to sit civil service examinations. However, since the women appear to have been largely middle-class and educated - the 'right class' of women according to Sampson - we can safely assume that they were familiar with the mathematics required before they were hired.

The first two computers were sisters, Sarah and Isabella Falconer. They were employed at the direction of the Astronomer Royal for Scotland, Frank Dyson. Employed as measurers, they would go on to compute plate constants, perform reductions and conversions, and other work such as library and general assistance. They would be joined by others - some women with degrees, most without, some working for only a few months, others for close to a decade. All were systematically ignored in written records.

"The amount allowed is £60. But I find that owing to the rise in women's payment, the right class cannot now be engaged for this sum. It requires to be increased to £100."

- R.A. Sampson, DSc, FRS [3]

They are conspicuous in their absence. Even when their work is referred to explicitly, they are often mentioned only in passing. In Edinburgh, the women are largely forgotten. Until recently, their legacy lay only in their work. With the consideration of the women's role in the AC resurfacing as a topic of historical interest, more consideration has been given to them as individuals.

As 'ordinary' women, most of the computers did not continue to work in astronomy. Some left to get married, such as Isabella, or to join the war effort, like Sarah. This is hardly surprising, considering the poor pay and stigma associated with the work. Still, as the first employed women in Scottish astronomy, they form an important part in the history of the AC.

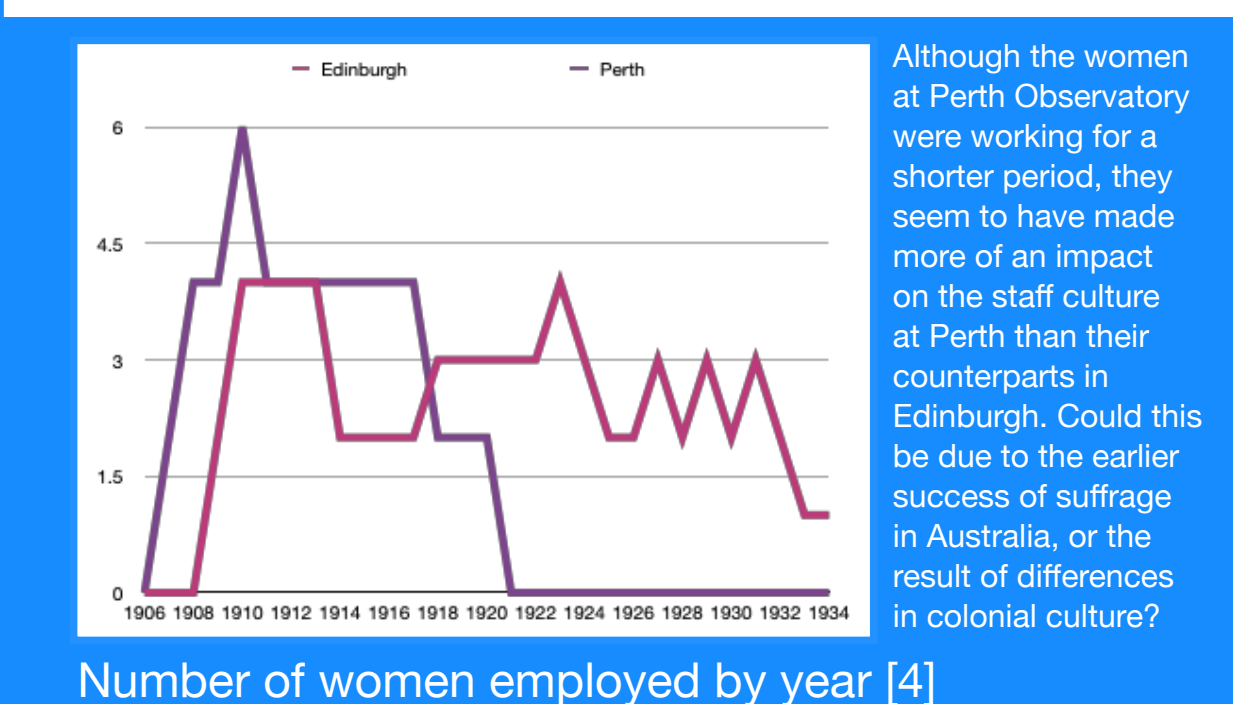
Astrographic Assistants in Perth

Eleven women worked as computers for Perth Observatory for the duration of its participation in the AC. Government Astronomer, Harold Curlewis, preferred young women for the work, due to their steady, nimble fingers and sharp eyes. However, as in Edinburgh, the women were not treated equally to male staff.

The salaries of the 'Astrographic Assistants' in 1912 ranged between £48 and £108 a year - a higher wage than some Australian teaching salaries at the time, but significantly less than male staff. This was recognised by Curlewis, who wrote in 1916 that "their present salaries are inadequate and not commensurate with the class of work they have to perform".

While the Government Astronomer attempted to advocate for the women, a letter from the Public Services Commissioner to the Under Secretary stated that the positions of the women must remain temporary as "there is no certainty at this date that the observatory will not be taken over by the Commonwealth". This uncertainty continued through the project.

One key example of the injustice faced by the women in Perth occurred when Acting First Assistant Nossiter decided to test the abilities of some of the women in 1914. He compiled a report of the errors made by two of the computers. The women took issue with this, and Prudence Williams, a senior female computer, wrote a letter to Curlewis on behalf of the others. She described Nossiter as a bully - "our enemy" - and accused him of interrupting their work. She said he asked them to do jobs "which he did not like doing himself" and even spied on them through a crack in the door.



Although the women at Perth Observatory were working for a shorter period, they seem to have made more of an impact on the staff culture at Perth than their counterparts in Edinburgh. Could this be due to the earlier success of suffrage in Australia, or the result of differences in colonial culture?

Number of women employed by year [4]

This is exemplary of the difficulties faced by women working in science at the time. However, in this case, the agency shown by Williams was met with support from the top.

Williams asked for this matter to be taken to the Public Services Commissioner if steps could not be taken in the office. Curlewis did in fact request an interview with the Public Services Commissioner, in a letter dated 10/08/1914, and said that he lost confidence in Nossiter being in a senior position. This demonstrates the respect Curlewis had for the women and their work.

It also brings into light the abilities of the women. The astrographic assistants not only worked on their own tasks, they also took on the work of Nossiter without training, appointment to the position of even a permanent computer, and presumably without additional recompense.

The Perth women displayed a surprising level of agency and influence in the structure at Perth Observatory. Although entirely dependent on Curlewis' support, this was novel for the time.

References

- [1] Sampson, R.A. Correspondence, Printing. Royal Observatory, Edinburgh: A50.433
- [2] Sampson, R.A. Correspondence, Staff. Royal Observatory, Edinburgh: A52.448. August 1919.
- [3] Sampson, R.A. Correspondence, Staff. Royal Observatory, Edinburgh: A52.448. August 1919.
- [4] Davis, Kerryn. Women Computers during the International Astrographic Project Perth Observatory. (Permission granted 27th June 2019).

Bibliography

- Astronomer Royal for Scotland (1891-1939) 'Annual Reports'. Edinburgh: Royal Observatory, Edinburgh
- Bruck, Mary T. (1995) 'Lady Computers at Greenwich in the early 1890s', Quarterly Journal of the Royal Astronomical Society 36 pp. 83-95
- Bruck, Mary T. (1998) 'Lady Computers', Astronomy Now 12 pp. 48-51
- Bruck, Mary T. (2009) Women in Early British and Irish Astronomy, Stars and Satellites. London: Springer
- Davis, Kerryn. Women Computers during the International Astrographic Project Perth Observatory. (Permission granted 27th June 2019).
- Davis, Kerryn (2020) Female Computers During the International Astrographic Project - SRO Excerpts. Perth. (Permission granted 27th June 2019).
- Jones, D. (2000) 'The scientific value of the Carte du Ciel', Astronomy and Geophysics 41 (5) pp. 16-21
- Kidwell, Peggy Aldrich (1984) 'Women Astronomers in Britain, 1780-1930', Isis 75 (3) pp. 534-546
- Turner, H.H. (1912) The Great Star Map: being a brief general account of the International project known as the Astrographic Chart. London: John Murray

Acknowledgements

This work would not have been possible without the support of my supervisor, Dr Isobel Falconer, and the Laidlaw team at the University of St Andrews. I have also made use, with permission, of invaluable research undertaken by Kerryn Davis, a volunteer at Perth Observatory. My thanks to her. Thanks also to Karen Moran, the archivist at the Royal Observatory, Edinburgh, for allowing me access to her records. Special thanks to the Laidlaw Foundation for funding and supporting this project.