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Tapping, Ken

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The Harvard Women

Ken Tapping, 5th March, 2019

Beatrix Potter was interested in the natural sciences and wanted to be a botanist. However, in 19th Century England it was nearly impossible for women to break into science, so she became a famous writer of Children's books. There were some women who overcame the obstacles of that time and became renowned scientists, such as Marie Curie. However, not all institutions were hostile to women, so some had the opportunity to make an indelible mark on modern astronomy.

In 19th-Century astronomy, women mainly worked as computers and data analysts. Back then, the word "computer" meant someone who spent their time doing calculations, by hand. Today, although computers still do all those calculations, the word now means something completely different.

Until quite recently, astronomical images were recorded on glass, photographic plates. They were insensitive by modern standards, and required exposures of many hours to record usable images. After processing, these plates were passed to the usually female data analysts, who carefully extracted the desired information, and meticulously searched the plates for other things that had been caught by accident, such as previously unknown comets, asteroids and exploding stars.

Back then observations were made mainly in two ways. The telescope could be used as a giant camera, recording images of the sky on the glass photographic plates. Alternatively, a diffraction grating would be put before the plate, often over the front of the telescope. This would split the light from each star into its constituent colours, just as we see when we pass light through a glass prism, or simply look at a rainbow. On these plates, each star image is smeared out into its constituent colours. From these the data analysts would establish the temperature of the star and its composition. By comparing any given star with its neighbours, its brightness could be measured.

Over time the women analyzing these plates came to understand photographic plates and their limitations, and became highly skilled at extracting information from them. To do this they had to learn some astronomical science, and over time, their work taught them a whole lot more, leading them to ask their own science questions and becoming researchers in their own right. In most places this evolution received little encouragement or was even deterred, but at other places, such as the Harvard College Observatory, things were different. The result was women making important and fundamental contributions to astronomy, some of which are still at the core of astrophysics.

For example, Henrietta Leavitt discovered a special class of variable stars, called Cepheids, after the first one to be discovered, Delta Cephei. These stars cycle periodically in brightness, and the time taken to cycle tells us how bright that star is. So we can look at a distant galaxy, find a Cepheid or two, measure their cycle time and how bright they look, and from this calculate how far away that galaxy is. She gave us a ruler to measure the universe.

One of the big efforts went into coming up with a system for classifying stars. After Williamena Fleming and Antonia Maury collected and tabulated a huge number, of observations, Annie Jump Cannon assembled them into the system we still use today. Then Cecilia Payne showed that this system was simply arranging stars in the order of descending temperature. These women, together with others, made significant contributions to astronomy and are recognized for them. One last thing: Beatrix Potter was interested in all natural sciences other than astronomy. Maybe that was her big mistake.

Mars lies in the southwest after dark. Jupiter lies low in the south in the predawn sky, with Saturn to its left and Venus shining brightly, low in the dawn glow. The Moon will be New on the 6th.

Ken Tapping is an astronomer with the National Research Council's Dominion Radio Astrophysical Observatory, Penticton, BC, V2A 6J9.

Tel (250) 497-2300, Fax (250) 497-2355

E-mail: ken.tapping@nrc-cnrc.gc.ca