

AT: Welcome to the Infinite Women podcast. I'm your host, Allison Tyra, and today I'm joined by Dr. Toner Stevenson, an honorary history affiliate at the University of Sydney, and the co-author of *Eclipse Chasers*, which includes women's contributions to solar eclipse science. Regular listeners may recall that Dr. Stevenson previously joined us to discuss women in the early years of Australian observatories, specifically in the context of the decades-long international Astrographic Catalogue project. But as always, the more you dig, the more women's stories you will uncover. So Dr. Stevenson is back to tell us about other turn-of-the-century women in Australian astronomy. So would you like to start with Jane Foreman?

[Listen to Dr. Stevenson's episode about the Australian women of the Astrographic Catalogue](#), or [read the transcript](#).

TS: Yes, that's a very good starting point. Thanks, Allison. Jane Foreman was really the first woman who officially joined the New South Wales branch of the British Astronomical association. And she was the first, and she was actually the only, woman of 43 members who were nominated and accepted by the male-only council at that time at the first meeting that was held on the 30th of January 1895. Now, this was in New South Wales, which is of course, a state in Australia, but over in South Australia, there were some very interesting things happening there because an earlier woman, Mary Emma Greayer, who also worked at Adelaide Observatory, so starting to see some connections here, she had already been appointed there as a member, and a few other women. And South Australia was very special because in 1894, the suffragette movement was very successful. And by 1895, women not only had the vote there, they could also be elected to Parliament. So there was a lot happening with women at that time.

There was also a really popular interest developing in astronomy. And that was the whole idea of these amateur societies, as was developed in South Australia, New South Wales, Western Australia and Victoria and Queensland eventually. So the idea was that you'd have all of these amateur astronomers who'd be doing the sort of work that the observatories and professional astronomers kind of didn't have time to do. So they needed a group of people who could use telescopes and observe with their eyes phenomena such as variable stars, stars that are bright and then fade a bit and then go bright again. And lunar eclipses. Some of these things are interesting, but they are not necessarily a cutting-edge science, which the professional astronomers were looking at, the chemistry of stars, for example. Some amateurs were too, but this sort of group or workforce of amateurs was able to get together and publish their results.

And around that mid-1890s, we start to see women come into the picture. And the first woman in New South Wales, Jane Foreman, she came to this area by very interesting means. She was born in Goulburn and she grew up in Goulburn. And Goulburn is an interesting place in that in 1874, a transit of Venus happened and it was really popular and Goulburn was one of the centres where astronomers gathered and the population got to observe through telescopes. So she was a young woman then. She was born in 1843. She had a series of family disasters, real sadness in her life. Her first three children did not survive as babies. And then her husband was injured. He ran the stagecoach at that time and he was injured in his work. He then committed suicide. So, you can imagine this woman who seems to have grown up surrounded by people who did things that were interesting. She knew the local reverend in the church there, who held lectures on astronomy and he had a telescope. She moved to Sydney and she married a doctor in Sydney. Now that then gave her entrée to a whole group of people in the university where he worked. And he practised on Macquarie Street, which is where a lot of other very esteemed professional people practised. And she became involved in a social circle that involved people who were interested and partook in science. And actually a lot of these people were also amateur astronomers. So being that sort of first woman, I have no evidence, but I can only assume that she was passionate about astronomy, that she had developed some expertise and that she was considered highly worthy of the position.

We then find that a number of other women start to join. And again, it's that sort of social connection that helps. She's only in that society for a couple of years, but during that time, a lady called Cecilia Maclellan joins and she is very interested in astronomy and she is talking with the media. So there's a lunar eclipse in Bondi and

she talks to the media about her observations during that eclipse and they report that. Now in Sydney and in the main cities: Melbourne, Perth, Adelaide, at that same time there's this whole lecture series going on and there's women who come over and give lectures. We're talking the early 1900s. In 1912, Mary Proctor, a British woman, comes and gives an extensive lecture tour around Australia and people flock to these lectures. There's a very popular author, Agnes Mary Clerke, and now if you go to almost any library, any of the state libraries or, even major country libraries, you'll find a book by Agnes Mary Clerke. In Australia, Mary Orr has published *An Easy Guide to the Southern Stars*. So there's a real buzz happening just before this First World War and women are part of the buzz. So we then see women joining these societies and they bring with them expertise because women are now graduating from university. So one of the other early members who joined the British Astronomical Association New South Wales branch in 1917 was Lucy Gullett. Now Lucy Gullett had a Bachelor of Science and of Surgery, so her expertise was in medicine and her sister joined as well. Her father was a member of the Legislative Council, he was also a member of the Astronomy Society. So these societies start to become family affairs where you have the father, the daughters, sometimes a husband and then the wife joins. But I think we would be incorrect to assume that they just join to be part of the social set, because we start to see their reports coming through in the papers and it takes a while. So I can imagine Cecilia Maclellan, she would have had to push a little bit to become the librarian. She ended up on the council of the BAA New South Wales. We see another lady, Edith Deane. So on the council of 12, we've got two women and this is the very early 1900s. So they had to know quite a lot about astronomy to be respected enough to hold those positions. They weren't just making cups of tea.

So we're seeing these women who are starting to appear and my main focus in this talk are these New South Wales women but just imagine the same thing is happening in the other states. And we get to 1910 and 1910 to 1914, things are really changing in the world. You've got a highly political and active suffragette movement happening in the UK and a woman called Rosina Dafter and her husband migrate to Australia. Now they migrate in 1910 with their two foster sons who want to join the merchant navy. To join the merchant navy, they have to know about astronomy. They have to be able to find their way on the seas. So Rosina Dafter, she's always been interested in science. And she was interviewed by the newspapers and she talks about, in the UK, lying on a mat on the ground looking up at the stars and then coming to Australia and just seeing so many more stars. She talks about her preciseness. She became a dress designer. So she's a woman who brings really good observational skills with her and between 1910 and 1920, she learns a lot and she's a self-taught person, but she's also teaching her foster sons. They're all learning together. And she learns enough to become really interested in astronomy and she also joins the New South Wales branch of the British Astronomical Association.

Now there's something very interesting about Rosina in that she lives in Queensland. And Queensland in 1922 was where the great solar eclipse that went right across Australia, that was where it landed. That was its last point. A lot of people gathered on the race course at Goondiwindi and I don't know if she was there or not but I do know that very nearby was another woman who was also an amateur astronomer and joined the New South Wales British Astronomical Association. And I can find no evidence, but perhaps they met or perhaps Rosina Dafter went and walked around and saw what the astronomers were doing and this really piqued her interest, because the year later she becomes a member of an amateur astronomy society. And by that time somehow she has a telescope. I have a photograph of the telescope and I'm on a mission to find out where she got that telescope from and where it went to afterwards, which I may never find the answer to but I'm quite hopeful. Now Rosina Dafter starts observing variable stars and that's also what the young woman who was observing the total solar eclipse from New South Wales becomes interested in. And they correspond back to the Sydney government astronomer and the head of the Variable Star Amateur Society chapter. And there seems to be a great push for observations and accurate reports, because a bit of tutoring and mentoring happens. Star charts are sent to her and she starts to report her observations not only to the Amateur Society but she starts to report them to Britain as well, to the British Astronomical Association and then to the American Association of Variable Star Observers and this is where she really finds her home. By now she's in her mid-40s and there's a

lot of women who are members of the American Association of Variable Star Observers and this is all by correspondence, by letter. And she sends, there's quite a lot of bravery in this, sending her observations over to America, to Britain and hoping that they're good enough. I can imagine her doing that and then she gets a note back, "yes and we've included them in our reports," because the publications are there and they have her name and they have 28 stars that she observed and the variations that she noted. So she is good enough, she's doing a great job. She is doing such a good job as well of just general observation that she does see the return of a comet. And she's in fact the first person in the Southern Hemisphere to see the return of this comet, which becomes big news in the newspapers and there's a photograph of her in the newspapers with her telescope. So she is making a difference and that becomes acknowledged. So we're now well into her work as an amateur astronomer and her work is becoming more and more professional in its nature. So between the years of 1929 and 1933 she made 1,071 observations as reported by the American Variable Star Observing group.

And later on there was Dorrit Hoffleit, who was actually a professor of astronomy. She becomes head of that chapter and when Dafer dies, Hoffleit is writing about her and writes again in a book later on about how this was exceptional. And other variable star observers do work of course, but Rosina Dafer was in the top five of people from all around the world who were sending their variable star observations in and that's quite extraordinary. She's quite good at explaining what she's doing as well, and that might be part of what her attraction is with journalists because when she observed this comet in 1927, she's reporting as a misty circular object in the sky and you start to see what this comet might have looked like to her through her telescope. She's very observational about what's happening in the atmosphere. So she becomes interested in the zodiacal light and this zodiacal arch which is seen just after sunset but much better seen at about 4 am or just before sunrise in the morning and she's up there. She's waking up in the morning getting out and you don't need a telescope to observe this. You do it by eye. She's getting up in the morning and she's noting and she's sending the her observations now of the zodiacal light to the British Astronomical Association, the head of that chapter who is over in Europe. So she's getting many, many aspects of her astronomy work getting expert and and really honing her skills. She's acknowledged for this in 1936. She is nominated as a fellow of the Royal Astronomical Society. She's the first Australian woman to be nominated and to be accepted. This is a big deal, to get those letters after your name, FRAS, is still a big deal. So it's 1936, she's 16 years down the track I think of when she really started to hone her skills. She's doing work that's being published around the world.

AT: What I find fascinating is as you were saying that her work was becoming more professional, it got me thinking about this line between amateur and professional in the sense of, are we just saying someone who gets paid to do this is a professional and anyone else who is not getting paid is an amateur? Because I feel like you see this a **lot** in women's history where these women were "amateur" scientists because no one was going to hire a woman. But despite the connotation of that difference in quality, many women who were considered amateurs were actually producing incredibly high quality work. They were corresponding, as you said with Rosina, they were corresponding with the top people of their day who respected them and their work. So I think it's one of those divides that has more to do with connotation and social barriers and social norms, rather than how good is your work.

TS: Yes that's quite the case. It's also the case that in Australia, there was this marriage bar that was only lifted in 1966. And so a woman who was married could only get certain types of work could not have hold a permanent position in any sort of government work and that's really where the research happened, government agencies like CSIRO, was called CSIR, all the observatories. All the major paid roles were supported by government and there was very much this legal barrier as well. And it was just assumed that it was up to the man, the man was earning the money, and that they were the top priority for careers in all areas of work, and that women could do what they wanted for free. But you also do see these men being very successful so-called "amateur" astronomers, and those men had other well-paid jobs elsewhere and could afford the top

equipment and had the latitude to be able to purchase equipment. I think having access to equipment would also have been quite a barrier for a lot of women. That's why I'm particularly interested in, where did Rosina Dafter get her telescope from? Because it must have been pretty good. These days we would probably not be too impressed by it, but to see this sort of misty ball of a comet, for the the first person to report that in the southern hemisphere it had to be a reasonable quality for its era.

AT: Well I think we're also getting into one of the barriers in this context isn't just gender, it's also class. So you had to have women who had enough free time and energy to pursue this, who did not need to worry about contributing to the family's household income, who, if they had kids, likely were able to afford support staff and as you said the the equipment or at least being of a social class where maybe you know people who not only share your interests and can maybe help get you into these societies, like maybe a dad - looking at you, Henry Gullett. (TS: Yes.) But it's very much a privileged existence that even allows for women to have pursued this.

TS: Absolutely and they had to have security. And a lot of women did not have that and they did not have the spare time. It looks to me that that women like Rosina Dafter, she had a husband. Her foster sons were off on the high seas and she was fairly responsible for herself. There's a couple of funny quotes by her husband, who was not the least interested in astronomy, but he was obviously very supportive. And I think that probably they had a good relationship and he supported her doing this work as well. Miriam Chisholm, who was the young woman who was at the total solar eclipse in 1922, she came from a very well-to-do family from Goulburn, the same town that Jane Foreman, the first woman we talked about, came from. And the other factor I see with these women is that major astronomical events occurred in their lifetime and they made it their business to see it. And that, as I said earlier on, I haven't found the exact proof of that all the time. But if you were living in Goulburn when there was that trans of the Venus, you would have been there. It was in the main park in the center of Goulburn and there were lots of people there with telescopes and they were showing the public. If you were around in 1922 you could not have picked up a newspaper, you could not have listened to radio then, you could not have walked the streets or gone to the local shop without knowing that there was this total solar eclipse. And people who had the means and the wherewithal to do it went to see it them for themselves. Schools were all issued little handbills and why I'm mentioning this is that these big astronomical events are very inspirational. And they inspire women just as much as men today. And we are in the middle, in Australia of a sequence of total solar eclipses. So we've got another one coming in 2028 so only a bit over three years away. Now, you hope that the fact that we have only 30 percent of all astronomers, professional astronomers are women in Australia and pretty much around the world. You hope that some of these big astronomical events will help inspire other women and provide the wherewithal for them to go and have a look at these events and to do something perhaps with that experience. Because I feel very sure that these big events had an impact on these women who decided to take up astronomy without being paid as amateurs, but very much certainly in the case of Rosina Dafter. She would have been out there pretty much every night looking at those variable stars and even in her late 70s she was keeping her eye on, I believe, 18 stars at that time and measuring the variation of their light. So that sort of determination and recording of experience was very, very embedded in their psyche.

We've talked a little bit about education too because these women all had access to some reasonable form of education. The first woman, Jane Foreman, she went to a good school in Goulburn. She would have left school at 14 or 15 but the groundwork was there and and she was encouraged to go to lectures and and to keep learning. Rosina Dafter, too, had a good education and was interested in continual learning. That importance of early education and the desire to keep learning is very much a part of of the reason that that they picked up astronomy. And perhaps a mentor. It wasn't always their husband or their father, but someone who took an interest in what they did. And in Rosina Dafter's case that seems to have been all by correspondence. I don't know if she actually ever met any of the people who she corresponded with. But the power of the letter then, I suppose, was as great as social media is today.

AT: Now one of the things that we discussed last time when you were here talking about the professional women astronomers, so the ones who were actually working in observatories albeit at lower level positions and for less pay than their male colleagues. But we were talking about the constraints around those women and the barriers that they faced. So how does that compare to the experiences of the women who were not in a workplace?

TS: In a way all women were experiencing sex typing, that "women do this and women do that." And that was reinforced in every aspect of their lives. However, if you were working in an observatory, until the end of the Second World War, you would have been in a separate area, working in a separate space, only having contact with male astronomers as supervisors pretty much and checking work. You would have not had a sense of having a career as an astronomer. Now there were of course some exceptions and Ruby Payne-Scott is someone who we now know quite a bit about in her work in radio astronomy. But she had to leave her permanent job when they found out that she was married.

AT: So she hid her marriage for like six or seven years because of the aforementioned marriage bar because she was working at CSIR. And when they found out, they basically downgraded her, took away her pension, she was no longer allowed to be a permanent employee. And I think it was about a year later that she became pregnant with her first child. And I assume she was quite unhappy with what had been done to her up to that point and so there was perhaps a bit less incentive for her to keep pushing and trying to balance family with that. But I love that her husband went along with this ploy, where people thought that she was living in sin in the 1950s when that was a big deal and god love him for going along with it I mean kudos to him.

TS: Absolutely and she was quite extraordinary in so many ways. And radio astronomy was not only about the mind and observations. You had to build the telescope, so you had to go out in the field and build those telescopes. So it was a physical thing as well. So she was sort of doing things that most women would not have even considered. And things like the living in sin relationship, but also I think she had a good sense of her own worth and that was part of her leaving, was that she was not going to be a second class employee. There was no maternity leave of course in that era and she went on to become a teacher and did other important work, not to be dismissive of her work after that time as well. So compare that to women who are amateurs. They had a lot more freedom. They would not have had that close connection to groundbreaking science and I think if you were someone like Ruby Payne-Scott, being part of that groundbreaking science, being there in conferences, perhaps the only woman amongst all those men. That was something that was quite apart and quite different to what amateur astronomers were experiencing around and that's by the 1950s, 1960s. Things change again when the Astronomical Society of Australia is formed and when women are part of that professional group and there's a realization over the first decade or so that women have to be part of astronomy. And things change, that organization starts to make changes in the astronomy profession. But there's always, where does it all start? It all starts with education and women feeling that they can do it too and that it's not a man's job. It's a job that any gender can actually embrace. And we can get into all sorts of areas of diversity because that's a very interesting field in many, many, most areas of professional work, and seeing where people can really bring great expertise and skills due to their diversity.

AT: I think something that you're touching on is this idea that certain areas are not for women and that women have never been involved and women being involved now is like a new thing. And what's interesting about that is inevitably, when you start actually digging into that, I have yet to find an area where that is actually true. And often you find that the women have, either by neglect or by deliberate effort, they have been written out of these histories. They're not included when the histories are taught or written about. And so that's something that I find interesting about, for example your PhD work and clearly the work that you're still doing, is that you are the one digging into the records, chasing these threads and finding these stories and making sure that they

are being brought into the light.

TS: Well, it's something I'm trying to do. I think yes, you said it's in many so many areas and still pervasive. I mean this is not astronomy but it really annoys me when I see those shows on TV where they're they're fixing a car or you know doing something like that and we see these two men. Chat, chat, chat, yes, yes, it's a blokey world. Well, there are women mechanics, just like there were women astronomers. Hey, what about all those women that had to fix the planes during World War One and World War Two and did all the work because there weren't enough men around? So yeah, we seem to be really good at still trying to sex type many areas of working life. And perhaps it all does come back to parents seeing that and and trying to counteract that. Because with some of these earlier women, I often wonder. I try and look at their parents, what were their parents doing? What what were they like? Because that sometimes does tell me a little bit about why that particular woman decided to go against the norm and why she became an astronomer and didn't spend her evenings doing what was considered more normal work? Or perhaps she did that as well but often it's something to do with the mentor, with the parent, with the education, with someone who they happen to meet or an astronomical event that can change it. So yeah we've still got a lot of work to do.

AT: I think something that you're getting at here is the importance of allyship, particularly male allyship. So as we're talking about the fathers and later the husbands, as well as mentors and colleagues and all of these men who are recognizing this woman has potential and/or she's good at what she does, and are encouraging her along the way. Because the simple fact is that a lot of women would not have been able to achieve what they did if it weren't for the supportive men surrounding them. And for example you look at someone like Mary Somerville, who famously the word scientist is supposed to have been created just to describe her because she couldn't be considered a "man of science." And in an astronomy context she used math to actually predict the existence of Neptune before it was even discovered. So she was a badass, is what I'm saying. But her first husband was completely unsupportive of these endeavors. And fortunately he died like a few years in and she was able to get on with being a badass. But you do have to wonder if she had had this restricting force in her life, like someone who literally has legal power over most aspects of her life. And not only that but just was almost certainly emotionally discouraging all the time. You have to wonder if she could have achieved much of anything under those circumstances.

TS: Very good example. And then you see the contrary example where someone like Mary Orr comes as a very young woman with her mother and sister to Australia and meets John Tebbit and he actually encourages her and she writes the first *Easy Guide to the Southern Stars*. And then she marries an astronomer who also encourages her and she becomes an eclipse scientist and expert and publishes with him. So could it have turned the other way? Yes, it could have. What you're saying, I think is absolutely correct. That influence of the environment you live in, who you're married to or who you have a relationship with, and parental, teachers at school, all of that does influence who you are, what you end up doing, how you see your potential. And these women saw their potential in astronomy. They saw, some more than others, and it's great that we've got digitization now of so many records that we can actually find out more about them.

AT: Join us next time on the Infinite Women podcast and remember, well-behaved women rarely make history.