Journal and Proceedings of the Royal Society of New South Wales, vol. 146, nos. 449 & 450, pp. 142-152.
ISSN 0035-9173/13/020142-11.

Some aspects of the scientific development and astronomical research of Penny Sackett

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Abstract

Penny Sackett was the Director of the Research School for Astronomy and Astrophysics at the Australian National University from 2002 to 2007 and is currently an Adjunct Professor at the same institution. She has made several significant contributions to dark matter in galaxies, galactic structure, microlensing and the search and characterisation of extrasolar planets. This paper looks at some aspects of the trajectory that led her to being appointed the Director of Mount Stromlo Observatory, one of Australia's internationally well known scientific institutions.

Keywords: Extrasolar planets, dark matter, galaxies, large optical telescopes

Introduction

Penny Sackett had a remarkable career that spanned three continents, viz: America, Europe and Australia. She belongs to a select group of scientific nomads who cross national borders seamlessly in the intellectual pursuit of the moving frontiers of astrophysics. She was the first woman scientist to become the Director of a major astronomical institution in Australia. She took over the Directorship of Mount Stromlo Observatory in July 2002. She was no stranger to Australia, as she had visited the country previously on her observation runs associated with her projects at the Anglo-Australian Observatory. What prompted her to apply for the Directorship, she said, "was the reputation of the people that worked there and also because of the place it held in world astronomy". She came with a vision. According to her, "The faculty that I inherited was stunning. You know, Bessell, Freeman, Peterson, Norris, Dopita and Schmidt. They were absolutely first rate, splendid teachers almost to a person and so really it was a matter of trying to reinvigorate that with some younger blood as well and watch the tradition continue".

Tragedy

However, even before she had time to settle down into her new job, tragedy struck. It was on a hot summers day on 18 January 2003 that fires engulfed Mount Stromlo and the Observatory. It was the most terrible catastrophe to befall the institution. The fires were so severe that they left a trail of devastation that had never been seen before. Only the charred remains of the once magnificent telescopes stood as silent witnesses in their burnt out domes including the $4 million Near Infrared Field Spectrograph (NIFS) that was undergoing final testing before being shipped to the Gemini North Telescope in Hawaii had been turned into a blackened melted mass. According to Sackett, "When the damage was assessed it was clear that we had lost all our research facilities – that is, all of our research telescopes on the mountain, all of our library facilities, and our workshop where we had built instruments for our telescopes and telescopes for other organisations". It was a difficult time for Sackett and a lesser person would have probably thrown his/her hat in and walked away. She stood her ground and began the rebuilding process with great determination and courage. She had to deal with a number of challenging and frustrating issues that not only involved the recalcitrant insurers, the keepers of the national heritage and staff morale. "The university put up some of its funds promptly, and the Federal government also gave $7.3 million to help us rebuild the workshops. So we were very grateful for that. That was probably the biggest issue, at least at the beginning", she said. The heritage issues were resolved with "really excellent compromises" so that a modern institution could operate within the constraints of a heritage listed building. As for staff morale, she continued, "I think as time went on, what became difficult was managing staff morale, because after the fire most people had, this sense of fight in them, that no, we're not going to let this get us down. No, this is not the end of Mount Stromlo Observatory. But when the rebuilding began to take much longer than people had anticipated, and when the insurance agencies were recalcitrant, it became a little bit harder to keep staff morale up".

Nevertheless, she pushed on. After the fires Sackett drew up a strategic plan for the years 2003 to 2007 in consultation with the staff to decide where the Observatory should be heading. This included, she said, "things like developing new leadership roles in the next generation of telescopes, increasing the number of graduate students that came to Mount Stromlo, increasing the efficiency of the telescopes at Siding Spring and supporting those that were most productive, expanding the breadth of the knowledge of the faculty, and maintaining and growing our instrumental and astro-engineering capacity".

Finding an astronomical niche

Sackett had arrived at Mount Stromlo with a track record of astronomical research and highly cited publications. Born in the small town of Lincoln, Nebraska she excelled in her studies at school and according to her, her secondary school physics teacher, "was instrumental in opening my eyes to the beauty and ubiquity, I would say, of physics, and without him I certainly would not have trained in physics later. He in fact taught us calculus just as a means to understand more physics". Her parents had only been trained at a vocational level and as they had not attended a university they were of not much help in guiding her in her career choice. However, her mother, she said, "was adamant about one thing, and that was that I should be trained in a way that I could earn my own living" and there was an expectation on the part of her parents that she would go to university. Having won a scholarship she attended the University of Nebraska in Omaha and as she went through university her "physics instructors became adamant that I should pursue a higher degree, which I hadn't thought of when I entered university", she said. After completing her undergraduate studies she enrolled for a PhD at the University of Pittsburgh which, according to Sackett, "was particularly well known at that time for its program in relativity and it had some very high powered general relativists". After graduating with a PhD in theoretical physics in 1984 from the University of Pittsburgh, it took her sometime to find a niche for herself. She completed her postgraduate studies at a time when there were very few women physicists in the US. It was difficult for women physicists to get jobs. Linda Schiebinger, a historian of science at Pennsylvania University notes that even as late as 1996 in the US the unemployment rate for women PhD physicists remained twice that of male peers (3.8% compared with 1.9%) after controlling for job experiences (Schiebinger 1999). According to Sackett, "It was difficult because there weren't very many women in physics. I think too that the networking opportunities simply weren't there. In general women were not mentored in the same way that men were mentored with respect to finding a job". There also seems to have been some prejudice against women in a highly male dominated discipline. The male locker room mentality was still prevalent in the US academic circles. In fact, this was also the case in Australian academic circles in the 1980s (Bhathal 1999). Sackett gives us a classic example of this. According to her, "I remember particularly once a famous scientist coming to visit when I was in graduate school, and the male graduate students were asked to go out to dinner with him, but I was asked to babysit one of the faculty's children so that he could go. I didn't do the babysitting, but then I didn't go to dinner either".

She worked at a number of jobs, viz: as a science journalist for *Science News*, as a teacher at Amherst College – a privately funded college attended by many of America's privileged minority, as a researcher at the Biological Sciences Department at the University of Pittsburgh and as a Program Officer at the National Science Foundation. Her breakthrough came when she won a small grant to study at the Kapteyn Astronomical Institute in the Netherlands, one of the major centres of astronomical research in the Netherlands. Some of the well known astronomers when she was there were Stuart Pottasch who was known for his work on planetary nebulae, and Renzo Sancisi and Tjeerd van Albada who were internationally recognised for their work on the distribution of dark matter in galaxies. The short stint provided her with the transition from being a theoretical physicist to becoming an observational astronomer.

Later her two years (1992 – 1994) at the Institute of Advanced Study at Princeton helped her to begin tying together several elements that she was interested in, viz: the structure and dynamics of galaxies which were related to dark matter. "And one way", she said, "to study dark matter is through microlensing. So all of these connections were sort of forged while I was at the Institute for Advanced Study in Princeton". Princeton she said was "extraordinarily important to me". It provided her with a springboard for the work she was going to do at the Kapteyn Institute where she worked for the next seven years. The work she did there centred exclusively around microlensing. It was during her time at Princeton that she realized "through the work of Bohdan Paczynski and Andy Gould that microlensing could be a way to look for planets, and not only the so-called MACHOS (Massive Compact Halo

Objects) that [were thought to] make up dark matter". So this was the direction she began to increasingly explore when she was at the Kapteyn Institute.

Extrasolar planets

Extrasolar planets around a Sun-like star were first discovered by the Swiss astronomers Michel Mayor and Didier Queloz in 1995. Mayor and Didier were hailed as the Galileo's of the 20th century and they opened up an area of research which has become very active and competitive. The method they had used is called the radial velocity or the Doppler technique. The more direct method is called the transit technique. In this technique the astronomers look for planets that partially eclipse the star that they are orbiting. This causes a temporary but periodic dip in the brightness of the parent star. However, Sackett employed the gravitational microlensing technique to search for extrasolar planets. It is based on the fact that gravity affects light, an idea that originated from Einstein. Unlike the microlensing method which is a statistical technique that can tell you about the planet population as a whole, the Doppler technique is a better method for studying individual planets. This is also true of the transit technique.

According to Sackett, "Gravity not only affects objects with mass, but it affects light. It can actually cause light to bend. And so when a massive object sits between a luminous object that's emitting light and a detector (an astronomer with a telescope) it can change the path of that light in such a way that more light reaches the observer than otherwise would, simply because there's some massive object sitting in-between. And that massive object is called a microlens, and you can think of it most often as just a normal star somewhere in the galaxy. It might be a star we can see, or it might be one we can't. If that star has a planet orbiting it, then the gravitational field will not just be the gravitational field of the star but the gravitational field of the star plus the planet. It's not so important that the field is stronger, because after all the planet is just a tiny fraction of the total mass of the star, but the distribution of that gravitational field is different. And that means that as a bright object such as a background star sends its light to the telescope, and it's moving as it does so because everything in the galaxy moves, it probes different parts of this gravitational field, which looks different in different places because of the presence of the planet. We can do what's called 'inverting' that problem by taking the light curve that we observe with the telescope and deducing what the gravitational field must have been, and in particular whether it was due to a planet orbiting a star. The remarkable thing about microlensing is that you don't even have to see the star that the planet is orbiting in order to detect planets. You're using the natural effect of the lensing that Einstein talked about to create a telescope that is more powerful than the ones you actually have available to you here on Earth".

In the same year (1995) that Michel Mayor and Didier Queloz discovered the first planet going around a normal star, Sackett formed the PLANET collaboration which consisted of astronomers from various parts of the world to provide continuous time coverage. One of her motivations for forming this team was the "possibility of being the first to detect an extrasolar planet", Sackett, said. However, the honour was to go to Mayor and Didier. Her second reason for getting involved in this venture was the fact that through studying dark matter she and her collaborators were confident that they could understand the microlensing signal. The chance to find out whether they understood the microlensing technique in their search for extrasolar planets came from their observations of the binary microlens MACHO–1997–BLG–41. According to Sackett, when they analysed their data they found that what they were seeing was "not a planet and a star but a double star system" (Albrow et al. 1998). By itself this was not extraordinary. What was extraordinary was the fact that they could "deduce this just from the microlensing light curve alone". This gave them confidence in their ability to understand and use the technique.

Ten years after she founded the PLANET collaboration, Sackett and her colleagues discovered a cool planet 5.5 Earth masses through gravitational lensing (Beaulieu et al. 2000). This discovery, she said, took them ten years rather than the five that she had hoped. It was an exciting discovery since up to that time no planet that was more like an Earth-like planet had been found. Most of the planets that had been discovered up until this time, she said, "were 100 to 300 times the Earth's mass". With the advent of the Kepler mission many more potential planets have been found that are more Earth-size. Since the last Kepler catalogue was released in 2012 the number of candidates discovered in the Kepler data now totals 2740 potential planets orbiting 2036 stars. The most dramatic increases are seen in the number of Earth-size and super Earth-size candidates discovered, which grew by 43% and 21% respectively.

Dark matter

Her observations of MACHO-98-SMC-1 in the Small Magellanic Cloud provided an interesting insight into MACHO (Massive Compact Halo Objects) events and dark matter. At the time they were doing this research, one of the big questions that microlensing was expected to answer was whether the dark matter was made up of small, compact objects, such as dead stars or Jupiters or some unknown objects that could cause a microlensing event. Many astronomers at that time were looking at stars in the Magellanic Clouds and seeing whether the light from them exhibited a microlensing curve as if there was a dark, unseen microlens between the observer and the Clouds. Whenever they received warning from microlensing teams that a microlensing event was in progress, they could immediately turn their telescopes to it. In the case of MACHO-98-SMC-1, they obtained an absolutely stunning light curve, Sackett said. According to her, "this was good enough for us to detect small things in this light curve that weren't (at least at that time) typically observed. And those included being able to tell when one part of the background star passed a particular point in the gravitational pattern, compared to when a different part of the star crossed". This allowed them to measure among other things the proper motion of the microlensing event. What they found, she said, "that alas, in this particular event, it wasn't some mysterious dark matter that was causing the microlensing, it was in fact a typical star in the Magellanic Clouds" (Alfonson et al. 2006).

A lot of hard work goes on into researching a problem. Quite often one goes down wrong paths and dead ends. However, sometimes one is rewarded like Archimedes with a Eureka or "aha" moment. This happened to Sackett. According to her, "it relates back to this problem of dark matter

– it had been suggested by some that indeed the dark matter in our Galaxy must be in the form of these MACHOs (Compact Halo Objects) that cause microlensing, and that in fact a colour magnitude diagram would actually show the population of these objects, some of which were stars. Now, what I mean by a colour magnitude diagram is that you plot the brightness of the star on one axis and the colour on the other, and if the objects are all the same age and same distance, then there'll be a pattern that develops on this plot that's quite characteristic. But if some of the stars are a little bit closer, and therefore, say, not in the Magellanic Clouds but between us and the Magellanic Clouds, then they would show up at a slightly different place on the colour magnitude diagram. And it was proposed that something like this was actually seen". There were several reasons why this suggestion bothered Sackett. "It was such a simple idea. It seemed to be there for all to see, this extra little addition in the colour magnitude diagram", she said. She was working at the Kapteyn Institute at the time, and in order to go up to the second floor where she worked she had to walk by the rack of new journals that had just come in. And on the cover of one of them was new data from the Hipparcos satellite showing the colour magnitude diagram not of the Large Magellanic Cloud but of the nearby stellar neighbourhood. And in that, she saw the very same additional feature. And that, she said, "was my aha moment, because I realised, this has nothing to do with the Large Magellanic Cloud. It has nothing to do with intervening objects that are in-between us in the Cloud. Nothing to do with dark matter. It actually has to do with stellar evolution. There is a period in stars' lives when they occupy this particular part of the colour magnitude diagram, and how many stars are there depend on how old the different populations are. And so with a postdoc we took many colour magnitude diagrams that he already had for the Large Magellanic Cloud. We analysed them this way, we showed that this extra feature was exactly where you would expect it to be, and it was occupied with precisely the number of stars you would expect it to be given the LMC's star formation history" (Beaulieu and Sackett 1998). "That aha moment", she continued, "was seeing in a completely different context the same signal, and therefore immediately knowing that this explanation was different than what had been originally proposed".

Galaxies

Over the last two decades, several studies have been conducted to understand the evolution of galaxies. For example, there has been a realisation that interactions between galaxies may play an important role, and observations have also been made of shells and rings around elliptical galaxies. Sackett and her colleagues carried out new observations and produced a photographic atlas of polar ring galaxies (Whitmore et al. 1990). Some astronomers were interested in the history of these galaxies and wanted to know what happened to these odd looking objects. Her interest in these fascinating galaxies arose from her desire to study the shape of dark matter haloes and how dark matter was distributed. The way astronomers deduced the presence of dark matter in galaxies was largely through rotation curves. They measured the speed of individual stars in the galaxy as a function of how far away they are from the centre, and this told them how much force they were experiencing and therefore how much mass the galaxy has that is acting upon that particular star or set of stars. This is how astronomers became confident that there must be more mass in the galaxy than we can see and there must be dark matter. With Linda Sparke, Sackett studied the polar ring galaxy NGC 4650A. She did this study when she was at the Kapteyn Institute for the first time on a small grant from the National Science Foundation. NGC 4650A is a strikingly beautiful object which has a central body of older stars in the middle, somewhat flattened into an elliptical shape. This is surrounded by a gigantic ring of gas and much newer stars that are orbiting in a completely perpendicular plane to the way the stars were orbiting in the central object.

They studied this galaxy because they could measure the rotation curve not only in the plane of the central body where there were stars but also in a plane perpendicular to it where there were stars and gas they could use for their analysis. According to Sackett, by studying these "you could ask the question: Do these two curves look the same because the distribution of matter is spherical? If this was the case it would not matter in which direction you looked because the gravitational field would be spherical. Or does the polar ring have a different rotation curve to that of the central body, which might indicate that the dark matter preferentially lies in one plane or the other" (Sackett and Sparke 1990).

From a more detailed analysis of the motions of the stars in this galaxy, Sackett said, "we found, after taking into account elliptical orbits and all sorts of other things, that the rotation curve of the stars and gas in the polar ring is different than that in the central region. That immediately tells you that the total gravitational mass is not spherically distributed". They knew that some of the matter is not spherically distributed because the galaxy's flattened and it has a ring. So one had to be more careful than that and they needed to subtract the effects of the mass they could see, and then ask themselves, of the mass that is left over, how is it distributed? "And the answer", Sackett said, "was as near as we could tell within the precision of our measurements that the dark matter was also flattened – not as thin as a stellar disk, but sort of as flat as a rugby ball or something like that". This work was important for those astronomers who were trying to understand what dark matter was made of, because certain proposals for dark matter were calling for a very flattened disk while others were calling for an absolutely spherical distribution. She said, they gave them "something in-between" (Sackett et al. 1994).

In her study of the spiral galaxy NGC 5907 she found a faint luminous halo around the galaxy. What surprised her and her colleagues was that the distribution of this light was more extended than had been previously recognised. It did not fall off as sharply as one typically expected in stellar haloes. According to her, "we asked the obvious question – is the light distributed the way we think dark matter is distributed? Because if it was, maybe there was a connection between this light we were seeing and dark matter". *Nature*, the British scientific journal decided to make it the cover story (Sackett et al. 1994) and it landed them in a controversy. Their critics began saying that Sackett and her colleagues were claiming that they had "found what dark matter was", despite the fact, she said, "that they were as cautious as they could possibly be in the write up of their abstract". Nevertheless, one of the benefits of this controversy was that it prompted other astronomers "to look for faint light around other galaxies, and it was found in many other galaxies as well", Sackett said. According to Sackett, "when people looked deeper, what they discovered was that it wasn't smoothly distributed but was often on streamers that were at great distance from the primary galaxy. And some of the new thinking (and no doubt this will be modified in time as well) is that this faint distributed light is in the outskirts of galaxies where the dark matter is because it's caused by satellite galaxies that have dropped into the potential well of the primary galaxy and slowly over time have had their stars stripped away into beautiful long tails that surround the primary galaxy".

Instruments for Studying the Universe

One of the major agenda items on Sackett's plate after the fires was to rebuild the workshops. From its beginnings in the 1920s, the workshops had always been an integral part of Mount Stromlo. Many of the instruments that had been used to make significant astronomical discoveries were based on the instruments that were designed and constructed in the workshops which has excellent technical staff. A modern up-to-date Advanced Instrumentation Technology Centre (AITC) was built in stages. Sackett was responsible for the building of Stage 1 which was opened in 2006. According to Sackett, "the goal of the Centre was to replace the activities that took place in the workshops at Mount Stromlo that were destroyed in the fire. Furthermore, she built the Centre for the future. It had a large integration and assembly hall attached to the electrical and mechanical design workshops and laboratories. The integration hall and the laboratories have been designed to cater for the next generation of instruments expected to be installed on Extremely Large Telescopes currently being planned by international consortia".

The Observatory had acquired a contract to build the Near-infrared Integral Field Spectrograph (NIFS) for the Gemini North telescope. However, as mentioned earlier, it was completely destroyed by the fires just before it was to leave the workshops for Hawaii. NIFS 2 was rebuilt by the Canberra based aerospace company, Auspace Ltd, in collaboration with Mount Stromlo designers and engineers. The completed instrument was shipped to Hawaii in August 2005 and installed on the Gemini North 8.1 metre telescope in October. Jan van Harmelen, the NIFS Project Manager and Peter McGregor, the Project Scientist spent a month at the Gemini North Observatory supervising the tests and the initial observations. First observations on the Gemini North telescope, she said, "showed unprecedented spatial and spectral detail in otherwise dust-obscured regions, allowing young stellar wind speeds and black hole masses to be measured. The whole project was a great success and a credit to the technical and scientific staff at Mount Stromlo Observatory".

The Observatory also secured a contract to build the Gemini South Adaptive Optics Imager (GSAOI) for the Gemini 8 metre telescope in Chile. This is a near-infra-red camera which is being used with Gemini's flagship Multi-Conjugate Adaptive Optics (MCAO) system on the Gemini South 8 m diameter telescope in Chile. The MCAO system corrects the blur due to the Earth's atmosphere over a wide field than has previously been possible. GSAOI records diffraction-limited images of astronomical objects with 0.02 arcsecond sampling over its full 85 x 85 arcsecond field of view.

"The GSAOI was designed and built by a team of engineers led by Peter McGregor. The team included John Hart, Dejan Stevanovic, Gabe Bloxham, Damien Jones, Jan van Harmelen, Jason Griesbach, Murray Dawson, Peter Young and Mark Jarnyk. The camera was shipped to the Gemini South telescope in Chile in October 2006".

Another instrument that was approved for construction in December 2005 was the Wide Field Spectrograph (WiFeS). It provides 950 simultaneous spectra throughout the optical frequency range. It has been installed on the 2.3 m telescope at Siding Spring. It has a data gathering capability of 10 to 100 times the rate of conventional spectrographs. In the same year Brian Schmidt's highly innovative telescope called the SkyMapper was approved for fabrication. "It is a 1.35 metre diameter telescope located at Siding Spring Observatory. It is a new breed of dedicated survey telescopes that will conduct the Stromlo Southern Sky Survey which will produce the first deep digital map of the entire southern sky. The design was produced by Conroy, Granlund and Oates", according to Sackett.

After the fires the astronomers had a long and hard think about what they wanted in terms of telescopes for the future. It would have been an easy exercise for them to go down memory lane and recreate what they had lost. But Sackett had rather bold ideas about what they should be looking for in terms future telescopes for Mount Stromlo. According to Sackett, "we thought that one of the legacies we would like to leave is that the future generation would have a facility that was to them what the AAT (Anglo-Australian Telescope) was in the 1970s and 1980s, namely, one of the biggest telescopes in the world that would be capable of doing things that otherwise weren't possible, but also a telescope that was reasonably versatile, that could have a variety of instruments and do different sorts of astronomy". Her biggest coup was to get Mount Stromlo involved in planning the world's next generation very large optical telescopes, called the Giant Magellan Telescope (GMT). The building to enclose the telescope will be as high as a 23-story sky scraper. The instrument will have ten times the resolution of the images from the Hubble Space Telescope. It will be a time machine which will allow astronomers to probe the darkest reaches of the universe and ask questions such as, when did the first stars, galaxies and black holes form?

Sackett had the audacity and courage to propose Mount Stromlo Observatory becoming involved in the effort to build the GMT. It was the best and far reaching decision she made for the future of Mount Stromlo Observatory and Australian astronomy. She signed the Memorandum of Understanding in Texas on behalf of the Australian National University. By signing the document, Mount Stromlo joined an elite group of teaching and research institutions in the US (Carnegie Institution of Washington, Harvard University, Massachusetts Institute of Technology, the University of Arizona, the University of Michigan, the Smithsonian Institution, the University of Texas at Austin and the Texas A& M University) to undertake the detailed design of the telescope. It will have six segments, each 8.4 metres in diameter surrounding a seventh mirror of the same size. The total light gathering power will be nearly seven times that of the Gemini telescopes.

The science objectives, Sackett, said, "will be many, because it is meant to be a multi-purpose telescope. But in particular, the image quality of this telescope is something that is of prime concern, so that using a method called adaptive optics, which can undo the blurring caused by movement in the atmosphere, this telescope should be able to not only take pictures that are as crisp as those of the Hubble Space Telescope but in fact much crisper. That means seeing more detail. It means being able to pull out faint, very distant objects from the background or from brighter foreground objects. That means finding more distant stars in the early universe. It means being able to actually see those planets orbiting other stars, detecting the light from the planets themselves, and thereby being able to analyse the atmosphere, for example, of those planets, which I think will be tremendously exciting". She hopes that construction may begin as early as 2014, assuming adequate funding becomes available.

Funding and research output

2002 was the first full year that astronomers from the Research School for Astronomy and Astrophysics were able to compete for ARC funding. "They were very successful in their grant applications winning over $2.7 million. Over 50% of the School's funding was derived from the increasing success of the School's astro-engineering design and fabrication teams". The arrival of Sackett at the Observatory in 2002 also brought in the new field of extrasolar planets into the traditional astronomy programs pursued by the Observatory. Together with the Research School of Earth Sciences, Sackett established a new Planetary Science Institute in 2002. According to Sackett, the Institute was "designed to cultivate a research program of planetary science combining the detailed studies possible in our Solar System with the recent wealth of information from the young field of extra-solar planets".

Despite the fires the Observatory "remained very active in research, publishing over 500 papers in refereed international journals", according to Sackett. The research effort spread over a number of speciality areas, viz: solar and extrasolar planetary systems, stars and stellar populations, the Milky Way and galaxies, dark energy and dark matter, gamma ray bursts, interstellar medium and galactic feedback, and adaptive optics.

Conclusion

Sackett achieved most of what she had set out to accomplish in her five year term. She had, as she planned reinvigorated the institution and continued the growth of the tradition of excellence. She steered the Observatory for a new beginning. Her decision to embark on the Great Magellan Telescope was the boldest, audacious and most visionary decision she made. She will be remembered in ages yet to come for her future vision for Mount Stromlo Observatory and Australian astronomy in the era of very large telescopes that will provide us with discoveries that we have yet to imagine. In 2007 Sackett completed her term as the Director of Mount Stromlo Observatory to take up in 2008 the position of Chief Scientist for Australia.

Acknowledgements

The author thanks the National Library of Australia for sponsoring the National Oral History Project on Significant Australian Astronomers and Physicists. The interview with Penny Sackett was conducted on 15 January 2013. All quotations used in the paper are from the interview that the author conducted with Penny Sackett. The full transcript of the interview is held in the archives of the National Library of Australia (Bib. ID 6183715). The author thanks Penny Sackett for agreeing to be interviewed for the Project and reviewing the paper and providing useful comments.

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Received 10 July 2013, Accepted 30 July 2013.

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