

Catley, 2006

BRIGHT STAR



BEATRICE HILL TINSLEY
ASTRONOMER

"This is one of our great stories,
New Zealand's and the world's"
– *Michael King*

Christine Cole Catley

For my three families

Sarah and Rob Beck and Anna
Nicola and Gavin Scott and Rebecca, Laura and Chloe
Martin and Jenny Cole and John and Annie

And for Michael King, colleague and friend



This book has been written with the assistance of a grant
from Creative New Zealand.

First published September 2006

Cape Catley Ltd
Ngataranga Road
P O Box 32-622
Devonport
Auckland
New Zealand.

Email: cape.catley@xtra.co.nz
Website: www.capecatleybooks.co.nz

Copyright © Christine Cole Catley 2006

The author asserts her moral rights. This book is copyright under the Berne Convention. All rights reserved. No reproduction without permission. Enquiries should be made to the publishers.

Typeset in Sabon 10/13 pt
Designed and typeset by Kate Greenaway, Beach Haven, Auckland
Cover design by Think Red, Devonport, Auckland
Printed by Publishing Press, Albany, Auckland

ISBN: 1-877340-01-4

Prologue

A woman stood in a swirling snow storm and knocked at the door of a house in Chester, England. She asked for a piece of coal. It was needed, she said, for a baby born almost two months too soon. The baby's name was Beatrice.

A German air raid aimed at the Liverpool docks in World War II had brought on her premature birth. Without enough heat in her family's house, she would probably not last the night.

Coal was rationed in war-time England. In the depths of winter people shivered beside tiny fires made up of the few lumps of coal allocated to them by the government.

And yet, when the woman asked for coal for the baby, it was given freely. In an almost biblical scene, people came to their doors or to the baby's house and gave their mite of coal, or contributed anything else which would burn in the open fireplace in the infant's room. The fire was built up. Gradually the temperature rose. Despite all the odds, the baby survived.

Thirty-six years later she stood at the entrance to a Yale University auditorium in New Haven, USA, greeting those attending a conference. It marked a major turning point in the world's understanding of the universe. She had planned the conference, organised it and succeeded in bringing together the cream of the world's cosmologists to take part.

Neither before nor since, astronomers say, has there been such a meeting of minds on this particular subject as at the Yale International Conference on the Evolution of Galaxies and Stellar Populations, and it was due to her efforts. Almost single-handedly, Beatrice had created a watershed in cosmology.

The years that had brought her to this point were arduous and extraordinary.

As the conference began, she had less than four years to live.

in the brightness measurement of the stars. The three of them set to work, with Burstein the instigator.

He did the nitty-gritty work of photometry, measuring the stars' brightness, and contacted Ivan King at Berkeley for some independent information. One day at Santa Cruz the three of them talked until late one afternoon. Sandy and Dave went home to their families, and when they showed up the next morning Beatrice had it all done.

'It was galling!' Sandy has said. 'It was the first taste of what it was like to work with her. It was sheer brilliance and effort and volume. I envied her the freedom to concentrate on work, but then I wanted other things besides work.' Beatrice, indefatigable, had computed models overnight and worked out how an error would translate. The flaw was such that the thesis had greatly under-estimated the brightness of very red stars, indicating that there were a lot more of them than there really are.

Sandy wrote the resulting paper. She considered Beatrice the leading light, as she had done all the calculations, but Beatrice insisted Sandy be the first author as she had put it all together. 'She was very generous to me. I desperately needed papers then.'¹⁷

They corresponded with the author and felt for her, but were of course glad to have put the record straight, or, as Sandy said, 'We had raised grave doubts. To the author's great credit she observed again after our paper, 'Rediscussion of the Local Space Density of M Dwarf Stars', was published. Donna was a good person.'

This 'awful story' underlined to them all the dangers of publishing without first thoroughly checking one's facts, something they henceforth emphasised to their students. It also alerted them to the great responsibility of being a thesis adviser.¹⁸

Jean Audouze became visiting professor for six months at the McDonnell Centre for Space Physics at Washington University in St Louis, Missouri. This also gave him the chance to work with Beatrice at Lick on a big paper she had invited him to join in writing, 'Chemical Evolution of Galaxies'.¹⁹

Beatrice also enjoyed talking more personally with Jean Audouze. She told him about decisions she had come to concerning her life – why she had decided to divorce, and the places she wanted to give in her life to her adopted children and to her research. Jim too came up from Pasadena when he could, and they worked on two large papers and part of another.

Edward Hill had found a way he could pay the Tinsley children a grandfatherly visit in Dallas. Through his continuing Oxford Group connections he had been invited to a congress in Brazil of the World Anti-Communist League, and then was able to visit his elder daughters. Edward had been important in Brian's life since they first met. For his part, Edward at that

time thought that Brian had been hard done by, and was determined to let him and the children see that their grandfather would be a constant in their lives. Brian made plans and lined up numerous people for Edward to meet, so much so that Beatrice found she had to cut short the time her father could have with her. Still, she was pleased that her children would be able to be with their grandfather. It fitted in with her picture of presenting them with a continuing family background.

She had had to look hard at dates and her invitations to meetings in many parts of the States, so that she could be in Santa Cruz and free to leave her office and do nothing except devote herself to her father for his short visit. Of course her concept of doing nothing was fairly elastic. Edward Hill, in *My Daughter Beatrice*, recalls his amazement when he got up early on the last day of his visit. Beatrice was driving him to San Francisco airport and they needed to make an early start:

When I got up I found her at the dining table with sheets of paper in front of her covered in obscure mathematical calculations. She had been sent an article to review for a scientific journal and had spent over an hour proving that the mathematics on which the author had based his conclusions were inaccurate. It was an astounding display of mental energy, especially as we had been up late the night before.

Beatrice's diary for April 1975 included visits to the University of Colorado in Boulder, to Sonoma and San Diego in California, to Princeton and Harvard and, she hoped, Yale for a couple of days. She had also to host an English astronomer visiting Santa Cruz from Cambridge, and there was a big American Physical Society meeting in Washington. Most of these engagements resulted from the publicity their cosmology paper had got in Dallas the previous year 'People want me to go and talk about it.' Incidentally she noted, 'The APS chose me rather than the other authors because it was organised by one of the most outspoken feminists in the university world!' This schedule of engagements came within six months of that casual put-down by the man who had not got around to answering her application to head the astronomy department at the UTD.

The Washington conference was enormous. Beatrice's talk generated much interest, and also a press conference. The most valuable aspect was being able to talk to some physicists afterwards. She was able to revisit some of her old haunts at Maryland, too. All in all the month of visits had made her realise what a good centre the Lick Observatory was, not to mention Yale. 'I feel very lucky not to be stuck in some second-rate place.'

The highlight of the month had been Princeton, both scientifically

and socially. Beatrice had been invited to give an informal seminar at the Institute for Advanced Study, but instead found the event rather formal, even formidable in view of a few dominant personalities there:

I decided to jump right in and talk about the cosmology on my mind, which is evidence that Einstein was wrong – right there in his own place. The result, as I hoped, was a lot of very interesting suggestions and discussions.²⁰

It's nice to be beyond the stage of being treated as a crank or an upstart.²¹

Sandy Faber was to say that Einstein gave everyone a new way of looking at the universe, while Beatrice used her knowledge of stellar evolution and applied it to his work. 'She was the first to imagine that the life histories of galaxies could be modelled just like the life history of individual stars.'²²

Edward had not taken the opportunity for a face-to-face discussion with Beatrice about her children. Now back in New Zealand, he wrote her a long letter. During a weekend when Brian had no child-minding assistance, Edward had been dismayed by what he considered Terry's attention-seeking and even violent behaviour, and inability to concentrate. Alan apparently was stoical, while Brian seemed greatly overburdened.

Beatrice at once phoned Brian to discuss the letter, then wrote at length to her father:

I asked Brian directly on the phone if he thinks Terry is troubled or seriously hyperactive, and he told me that neither the doctor (a child specialist) nor her teacher thinks she has problems. In particular she isn't a problem with her behaviour at school, and is doing very well in her work – which she wouldn't be if it were a clinical case of hyperactivity. Terry has always been excitable and nervous and prone to react violently, so perhaps the problems aren't as worrisome as they look.

We intend to arrange for Alan and Terry to visit me separately sometimes, which should be very good and helpful for them.

I wonder very much how Terry would have seemed to you say a year ago, when I was there. She probably wouldn't have been your ideal of a little girl then, either, and I'm afraid I've never tried to tell her that girls should be ladylike. I also wonder how much both of them are suffering, consciously or not, at my departure. They seemed very accepting in December when I left, but the reactions are bound to be very deep.

No doubt life is difficult for Brian, but your description of his problems sounds exactly like my life was for years and years: couldn't open a briefcase from Friday afternoon until Monday morning (even if I was free and I did, Brian resented it!), couldn't rest without being interrupted, and had my career impaired by distraction and tiredness.

It must have been pretty unpleasant for you, visiting two halves of our broken family. I'm not trying to duck responsibility for the difficulties you describe at Laguna Drive, but perhaps you can understand that I believe that if I was still there, all of us would be a great deal more unhappy.

The children went to pieces over Brian's and my problems, and at least since I moved out in August I've been able to feel peaceful in their company. I wish they'd had an example of how to live harmoniously.²³

Beatrice went on to thank her father for his frank opinion, which she appreciated, adding that it would be good if he lived closer to them all.

It is a sad letter in more than one way. Both parents cared very much for the children, but neither – through nurture, temperament or experience – was really able to perceive what was going on in the home, something that was obvious even to Edward. As for Beatrice's reaction to her father's retailing of Brian's difficulties and inability to get any time to himself, she must have taken a certain wicked pleasure in being able to describe so exactly how it would be for him. She did not remind her father that she had wanted to take the children but that Brian had steadfastly refused to let them go. In fact, she most probably reprimanded herself for letting the ghost of a grin appear while she was writing; she would despise herself for gloating, but, all the same, it was interesting to see the tables turned ...

Beatrice was pleased by the write-up she was given in *Science News*, the periodical read mainly by scientists so they can catch up on other fields, but as usual her next letter home made no mention of her main concern over the past weeks. This was her relationship with Jim. When they came together it was still often too much like lightning on a mountain top. Everyday living, quiet appreciation of each other, did not seem possible or did not last except when they were working together.

Then they went away for a weekend. Beatrice expected it to be a quiet, contemplative time. Instead, Jim was wracked with depression as he looked at his life. One factor in this was discovering that he had been wrong in aspects of their joint project. In science everyone's good work is built on the good work of others. In theory, scientists should rejoice in each new discovery. In practice, scientists find it no easier than other mortals

cosmological model, which neither expands nor contracts. Once it was realised (thanks to Hubble) that the universe was expanding, there was no necessity for a cosmological constant. It turns out, however, that the cosmological constant is a realistic possibility. Beatrice saw the theoretical possibility, but the first observational evidence was not produced until the late 1990s.

²¹ 4 May 1975.

²² S.F. to author, 8 January 1992.

²³ 4 May 1978.

²⁴ J.G. to author, 31 August 2001.

²⁵ Ibid.

²⁶ Psychologist William Domhoff.

²⁷ 2 June 1975.

²⁸ David Burstein to author, 10 January 1992.

²⁹ Gail Burstein to author, 7 January 1992.

³⁰ Alan Tinsley to author, 9 January 1992.

³¹ S.F. to author, 23 January 2000.

Chapter Seventeen

Going Somewhere

¹ 27 June 1975.

² J.G. to author, 31 August 2001.

³ Virginia Trimble to author, 4 November 2000. 'Beatrice had a feeling for fringe people. She could see the wheat in the straw.'

⁴ J.G. to author, 2 September 2001.

⁵ Virginia Trimble to author, 16 August 2000.

⁶ Ibid.

⁷ This article was published in *Scientific American* in March 1976.

⁸ 29 July 1975.

⁹ She was referring to Gus Oemler and Chris Wilson.

¹⁰ Beatrice soon learned that he preferred to be called Richard.

¹¹ R.L. to author, 22 January 2000.

¹² Bill van Altena to author, 26 August 1991.

The influence of the writer Betty Friedan, whose 1963 book *The Feminine Mystique* almost single-handedly revived feminism, and who in 1966 helped found NOW, the National Organisation for Women, spread rapidly through most areas of American culture.

¹³ More than one observer has said that Beatrice would have been opposed to some of the ways in which affirmative action has been implemented in the US in the years since her death, in spite of the good intentions behind such moves.

¹⁴ Pierre Demarque to author, 28 August 1991.

¹⁵ Ibid.

¹⁶ Dorrit Hoffleit to author, 29 August 1991.

¹⁷ J.K. to author, 3 September 2000.

¹⁸ Bill van Altena to author, 26 August 1991.

¹⁹ R.L. to author, 1 September 1991.

²⁰ 24 September 1975.

²¹ R.L. to author, 1 September 1991.

²² 16 October 1975.

²³ Jim Rose to author, 29 October 1991.

²⁴ 12 November 1975.

²⁵ S.F. to author, 13 December 1991.

²⁶ Jim Gunn was to laugh at being included in this, saying, 'What, me, a poor boy from Texas, knowing Plato?' J.G. to author, 3 September 2000.

²⁷ 7 November 1975.

²⁸ Ibid.

²⁹ 7 December 1975.

³⁰ R.L. to author, 14 January 2000.

³¹ Nelson Caldwell to author, 26 June 2002.

³² R.L. to author, 1 September 1991.

³³ Bruce Twarog to author, 5 July 2003. He is a professor of astronomy at the University of Kansas in Lawrence.

³⁴ Barbara Anthony-Twarog to author, 7 March 1996.

³⁵ Ibid.

³⁶ Alan Tinsley to author, 10 January 1992.

³⁷ Nelson Caldwell to author, 26 June 2002.

³⁸ 6 April 1976.

³⁹ Alvio Renzini to author, 28 October 2003.

⁴⁰ 23 April 1976.

⁴¹ 26 May 1976.

⁴² R.L. to author, 2 September 1991.

⁴³ J.K. to author, 10 December 1985.

⁴⁴ Ibid.

⁴⁵ Proceedings of this session were published by Rydel.

⁴⁶ Scott Tremaine to author, 10 October 2003.

⁴⁷ Curt Struck to author, 4 April 2001.

⁴⁸ Ibid.

⁴⁹ Nelson Caldwell to author, 26 June 2002.

⁵⁰ 23 September 1976.

⁵¹ R.L. to author, 15 January 2000.

⁵² Martin Rees became Astronomer Royal.

⁵³ Bob McClure to author, 10 August 2003.

⁵⁴ R.L. to author, 31 August 1991.

⁵⁵ Alan Tinsley to author, 9 January 1992.

⁵⁶ Gary Steigman to author, 22 June 2003.

⁵⁷ Curt Struck to author, 4 April 2001.

Chapter Eighteen

Year Of The Galaxies

¹ 18 February 1977.

² R.L. to author, 14 January 2000.

³ R.L. to author, 3 January 1992.

⁴ Curt Struck to author, 4 April 2001.

⁵ Gary Steigman to author, 22 June 2003.

⁶ 15 March 1977.

⁷ Curt Struck to author, 4 April 2001.

⁸ Ivan King to author, 18 July 2003.

⁹ Nelson Caldwell to author, 26 June 2002.

¹⁰ Ibid.

¹¹ R.L. to author, 14 January 2000.

¹² Nelson Caldwell to author, 26 June 2002.

¹³ Curt Struck to author, 4 April 2001.

¹⁴ The Hubble constant measures the rate at which the universe is expanding.

¹⁵ Curt Struck to author, 26 June 2002.

¹⁶ Ivan King to author, 20 July 2003.

¹⁷ Ken Freeman to author, 20 October 2003.

¹⁸ R.L. to author, 14 January 2000.

¹⁹ J.G. to author, 3 September 2001.

²⁰ Barbara Anthony-Twarog to author, 25 April 2001.

²¹ Laser printing was not yet available. The first laser-printed thesis from Yale's Astronomy Department was in 1981, Linda Stryker's 'Stellar Populations in the Large Magellanic Cloud.'

²² 5 August 1977.

²³ Dorrit Hoffleit to author, 29 August 1991.

²⁴ R.L. to author, 15 January 2000.