Australian Astronomer John Tebbutt. The Life and World of the Man on the $100 Note *by Ragbir Bhathal*, (Kangaroo Press, Kenthurst, NSW, 1993), pp.111, illustrated, $19.95, ISBN 0-86417-511-1.

The history of nineteenth century science is moving steadily in Australia. There is, however, an inviting field for the biographer's pen. With strong government pressure to encourage students to enter training and careers in science, there is good reason to acquaint them with our outstanding scientific pioneers, many little known to the general public. John Tebbutt in such a one. His gentle, rather wistful face looks out from our $100 note (one surprisingly enough of five Australian scientists, Hargrave, Florey, Tebbutt, Mawson, Clunies Ross, to be so immortalised) and he represents, par excellence, that phenomenon of individual nineteenth century enterprise and accomplishment, the productive private astronomer.

By descent, Tebbutt was a farmer. Born in 1834 at Windsor, New South Wales, he grew up assisting on his father's farm, but, from a classical and mathematical education acquired at some good Church Schools and from his own keen reading, he became addicted to mathematics, astronomy, and machinery. "The bent of my mind", he reflected later, "was always directed towards mechanics and the leisure hours of my boyhood were chiefly spent in the construction of farming implements and models of various kinds of machines". Using rudimentary instruments, Tebbutt observed his first comet at Windsor at the age of nineteen and, across the next sixty years, became the most famous of the Australian astronomers, his output of astronomical observations and paper surpassing those of the relatively well-funded Colonial Observatories, and his private Observatory at Windsor recorded in the list of world observatories.

Tebbutt made an early reputation in observing the great comet of 1861 (subsequently named the Tebbutt comet), an event missed by the Government Astronomer in Sydney. With such talent on tap, he was soon invited to join Sydney Observatory as Colonial Astronomer, a post he consistently declined, being both antipathetic to the routine of a large establishment, philosophically convinced that astronomical knowledge should be the object as far as possible of private enterprise, and the view that "an inferior instrument might be the means of doing good work if handled by a skilful observer, who was really the soul of the instrument". For Tebbutt, this last view proved correct. Between 1880 and 1899, the Observatories at Sydney, Melbourne and Adelaide produced between them 289 comet positions while Tebbutt's total reach 700, and his discoveries of the Great Comets of 1861 and 1881 (for which he was hailed in world astronomical circles) were made on relatively simple telescopes and instruments.

One of the most interesting chapters in the book is devoted to "Instruments and Observatories". Nineteenth century astronomy was a field in which pure science and industrial enterprise became directly linked. From the Industrial Revolution, the growth of big industry contributed to the production of high quality and precise astronomical instruments. As Bhathal points out, astronomers drove technicians to improve instruments, and offered new designs themselves, and specialist workshops and manufacturers emerged to meet the developing need. Colonial Observatories depended almost exclusively on importing this sophisticated technology, both telescopes and accessories, from makers such as Troughton and Sims and Cooke and Sons in Britian, Grubb

in Dublin, and optical designs, mountings and accessories from the advanced German workshops. Tebbutt used the Fraunhofer or German mounting for his principal telescope, the 20.3cm Grubb refractor.

But two local developments held the hope of spurring indigenous manufacturing enterprise in a field in which Australia's scientific reputation ran high. Angelo Tornaghi, an Italian instrument and telescope maker who arrived in Sydney to supervise the installation of the Negretti and Zambra instruments for the new Sydney Observatory in 1858, stayed on to establish a scientific instrument, optical and clockmaking business in Sydney and to make a 5cm transit telescope and ring micrometers for Tebbutt. In addition, H.C. Russell, one of Sydney University's first graduates and Australia's first native son to head a major scientific institution on his appointment as Government Astronomer of New South Wales in 1870, was a strong advocate of local manufacture. Keenly interested in telescope and instrument design himself, he engaged the Sydney firms of Morts Dock Engineering and Atlas Engineering to manufacture telescope mountings for Sydney's Observatory. Neither thrust, however, stimulated large local manufacturers to interest themselves in this line of work. Clearly Tornaghi and his work are subjects for further reasearch.

Nonetheless, Tebbutt and his remarkable comet sightings, his work on double stars, lunar and solar eclipses, and major and minor planets attracted professional and public interest and he was a household word in his long lifetime, his letters and articles in the Sydney press communicating his discoveries, and his detailed observations and recordings flowing into the international astronomical literature. Significantly, it was characteristic of lively nineteenth century popular interest in science that a private astronomer and intellectual who espoused that "the heavens presented a vast clock accurate to the minutest fraction of time" could command the wide attention and admiration of the community. As Governor Brisbane had at his Parramatta Observatory in the early 1820s, so John Tebbutt at Windsor between 1856-1916 stamped Australia firmly on the astronomical map.

Dr Bhathal sees this book as a prelude to a larger biography of Tebbutt, a major player on the scientific Colonial scene. As such it should have considerable appeal to school and student audiences, while, with its appendices of selected Tebbutt correspondence, comets observed, sketch of the Windsor Observatory and its program, and glossary and bibliography, it should also be of value and interest to scientists and historians.

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Science Parks: An Experiment in High Technology Transfer *by Lesley Grayson* (The British Library, London, 1993), pp. vi + 144, £ stg. 50.00, ISBN 0-7123-0788-5.

This book is one of the British Library's Science Reference and Information Service science policy titles. It can be best described as a 'guide' to and review of recent literature on science parks — a hybrid bibliography and commentary.