

## Astrographic Catalogues of British Observatories

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**ABSTRACT** At the International Congress of Astronomers that met in Paris, in 1887, to plan the mapping of the sky by photography, British observatories undertook the photography of approximately quarter the sky. This paper describes the contribution to the Astrographic Programme of these observatories and of other British establishments that subsequently offered to participate in the project.

### 1. Introduction

The Carte du Ciel project, designated the Astrographic Programme in English, was launched by an International Congress of astronomers in Paris, in 1887, with the aim of constructing a photographic map of the sky and of compiling, by means of photography, a catalogue of more than two million stars. The zones of observation assigned to the 18 observatories that offered to participate in the work are shown in Table 1. The table shows that Britain and France became responsible for observing 51% of the sky with French observatories undertaking 23.7% and British (including Colonial) observatories 27.3%. This paper reviews the progress of the Astrographic Programme in British observatories using unpublished data in the archives of the Royal Greenwich Observatory as well as information published in diverse sources. The scope of the paper precludes a discussion of the special series of meridian observations made by each observatory to determine the positions of several thousand reference stars used in the reductions of the photographic observations. For the same reason, little reference is made to the many research papers which the Programme generated and which greatly influenced the development of photographic astrometry.

Observatories	Latitude	Declination Zone	Zenith Distance	% of sky area
Greenwich	+51.929	+90° to +65°	-13.931 to -38.931	4.7
Vatican	+41.54	+64 to +55	-13.6 to -22.6	4.4
Catania	+37.30	+54 to +47	-9.30 to -16.30	4.4
Helsingfors	+60.9	+46 to +40	+14.9 to +20.9	4.4
Potsdam	+52.23	+39 to +32	+13.23 to +20.23	5.6
Oxford	+51.46	+31 to +25	+20.46 to +26.46	5.4
Paris	+48.50	+24 to +18	+24.50 to +30.50	5.6
Bordeaux	+44.50	+17 to +11	+27.50 to +33.50	5.9
Toulouse	+43.37	+10 to +5	+33.37 to +38.37	5.2
Algiers	+36.48	+4 to -2	+32.48 to +38.48	7.0
San Fernando	+36.28	-3 to -9	+39.28 to +45.28	6.1
Tacubaya	+19.24	-10 to -16	+29.24 to +35.24	5.9
Santiago	-33.27	-17 to -23	-10.27 to -16.27	5.7
La Plata	-34.55	-24 to -31	-3.55 to -10.55	6.2
Rio de Janeiro	-22.54	-32 to -40	+9.6 to +17.6	6.3
Cape of Good Hope	-33.56	-41 to -51	+7.4 to +17.4	6.6
Sydney	-33.52	-52 to -64	+18.8 to +30.8	5.9
Melbourne	-37.50	-65 to -90	+27.10 to +52.10	4.7

Table I Observatories and areas of sky allocated to them.

## 2. British Astrographic Telescopes

The astrographic telescopes used in British observatories were made by Howard Grubb (Dublin). After three years of experimentation in which he received valuable assistance from several astronomers Grubb<sup>(1)</sup> developed two kinds of photographic doublet that were used in astrographic telescopes that he manufactured. The first, in which the flint glass component is in front of the crown glass, was supplied to observatories at Oxford, Sydney and Melbourne while the second, and more conventional design, with the crown glass in front, was fitted to the telescopes he made for the Greenwich and Cape Observatories. Almost all the telescopes used in the Astrographic Programme were made either by Gautier of Paris (nine) or by Grubb (seven).

## 3. The Greenwich Astrographic Catalogue

In 1887 the Astronomer Royal was W H M Christie; he represented the Royal Society at the Paris Congress. His Chief Assistant was H H Turner, who joined the Royal Observatory, in 1883, from Cambridge University. Turner's method for the determination of the equatorial co-ordinates ( $\alpha, \delta$ ) of a star, from the measured coordinates ( $x, y$ ) of its image in a photographic plate, established his reputation.<sup>(2)</sup> Under the direction of Christie and his Chief Assistants and with extra resources provided for the work, the photography and reductions made rapid progress at Greenwich. The Greenwich Astrographic

Catalogue was published by 1908 and the photographic map of the Greenwich zone was distributed in 1910. The catalogue work was repeated in the 1920's for the determination of proper motions over the 30-year interval.

#### 4. The Oxford Astrographic Catalogue

The success of the Astrographic Programme in Oxford University Observatory was almost entirely due to the extraordinary enterprise of H H Turner who became Director there in 1894. The Observatory was underfunded and understaffed for astrographic work but with the aid of voluntary helpers and low-paid schoolboy assistants he managed to complete the catalogue work in a surprisingly short time. The work was mainly funded by grants obtained from the Royal Society.<sup>(3)</sup> The Oxford Astrographic Catalogue was published in 7 volumes over the years 1906 to 1911 but the photographic map was never realized. Turner also used his helpers to assist other observatories and the catalogue plates taken and measured at the Vatican Observatory were reduced at Oxford. Later, as first President of Commission 23(Astrographic) of the International Astronomical Union (IAU), he used his influence and experience to aid observatories in arrear with their astrographic work.

#### 5. The Cape Astrographic Catalogue

It was natural that David Gill, Director of the Cape Observatory, who had played such a prominent part in the generation of the Astrographic Programme, supported the project in his own observatory, the funding of which was increased for the work. But he held up the photography for a few years so that the date of observation would be closer to 1900, the epoch of the catalogue. He may have regretted the delay in 1907 when ill-health forced him to resign and the progress of the work slackened. The photographic map of the zone was never printed but the Cape Astrographic Catalogue, contained in 11 volumes, was published over the years 1915 to 1928.

#### 6. The Sydney Astrographic Catalogue

In 1887 Australia was a British Colony that was governed from London with local autonomy entrusted to state governments that maintained observatories at Sydney, Melbourne and later, at Perth. In these observatories astronomy took second place to services such as meteorology and education and when, in times of economic recession, the observatories' budgets were reduced the support for astronomy appears to have always been the first to suffer. In the light of experience one can see how convenient these observatories would have found the services of a Central Bureau for the reduction of all astrographic plates such as Gill<sup>(4)</sup> favoured but others opposed.<sup>(5)</sup> The Sydney Astrographic Catalogue was published in 53 volumes over the years 1922 to 1971.

### 7. The Melbourne Astrographic Catalogue

Despite the meagre resources of Melbourne Observatory, Astrographic observing got off to a good start there and the first 3 volumes of the Melbourne Astrographic Catalogue were published by 1929. But the Observatory closed down in 1944 and the work was handed over to Sydney Observatory where Harley Wood completed the reductions and published the outstanding 5 volumes of the Catalogue between 1953 and 1962.

### 8. The Perth Astrographic Catalogue

Perth Observatory was founded in 1896 and in 1900 it was invited to take over the observation of the zone originally assigned to Rio de Janeiro. It was aided in the work by the Royal Observatory, Edinburgh, (ROE) where about a third of the Perth plates were reduced. The first 6 volumes of the Perth Astrographic Catalogue were printed by 1916 but the Observatory was unable to publish the ROE results. At the request of the IAU, who paid for the work, ROE published the remaining 3 volumes between 1948 and 1952.

### 9. Hyderabad Astrographic Catalogues

Because of the poor progress made in the observation of the zone allocated to Santiago, in 1909, the Nizamiah Observatory at Hyderabad, in India, was invited to observe the northern half of the zone. The work was performed so efficiently that, in 1921, the Observatory was asked to extend its coverage to take in the southern half of the zone as well. The Hyderabad Astrographic Catalogue for the zone  $\delta = -17^\circ$  to  $-23^\circ$  (inclusive) was published in 7 volumes between 1918 and 1930. In 1928, when asked by the IAU who offered to defray the cost of printing the catalogue, the Observatory commenced observing the northern half of the Potsdam zone ( $\delta = +36^\circ$  to  $+39^\circ$ ). Three of the 4 volumes of this catalogue were published by 1938 and the final volume appeared in 1946.

Acknowledgement I am deeply indebted to Miss Janet Dudley for her help in the preparation of this paper.

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