AN ASTRONOMICAL BI-CENTENARY

The Abbé de Lacaille's Visit to the Cape, 1751-1753

Two hundred years ago the main preoccupation of astronomers was with the globe on which they lived and the Solar System of which it was a member. The starry constellations formed a convenient background against which to chart the movements of the bodies constituting this System. To ensure precision in the measurements of these movements, it was necessary to pin-point accurately the positions of the stars in the heavens.

This need was obvious to the ancients. The earliest observers of the stars had been pastoral races, whose shepherds, watching their flocks by night, imagined that they saw, pictured in the stars, their deities, the heroes of their mythical lore, and the animals of their field and chase. The Sumerians and Accadians, indeed, described the stars collectively as a "heavenly flock"; the sun was the "old sheep"; the seven planets were the "old-sheep stars"; the flock as a whole had certain "shepherds" who were ruled by *Sibzianna* (almost certainly Arcturus) which was the "star of the shepherds of the heavenly herds". Such star-lore was the common heritage of primitive pastoral races; and it has been said that the astronomical lore of the South African Bushmen was more elaborate than that of the early Greeks.[1]

But later, Greek scientists realised that astronomy was a science transcending the needs of ploughmen and shepherds; while, before the Greeks, seagoing Phoenicians had awoken to the fact that an exact knowledge of the stars could render peculiar service to navigators. Accepting the nomenclature of the stars handed down to them by their pastoral forebears, the Greeks proceeded to "create the constellations *qua* constellations". The labours of these early Greek astronomers were, as far as the stars were concerned, devoted to determining the position of each star with the maximum accuracy which the crude instruments of their day allowed. Their observations were collected together in catalogues one of the earliest of which is the catalogue of Hipparchus compiled in the second century B.C., and substantially preserved in the *Almagest* of Ptolemy written three centuries later.

These ancient catalogues were deficient in one fundamental particular: the stars surrounding the south celestial pole were invisible from the northern hemisphere and so unknown to the catalogue compilers. This region was a blank on their charts. Not till 1603 was the deficiency partly removed. In that year the German astronomer Johann Bayer published his momentous *Uranometria* and in it he added 12 new constellations to the 48 of Ptolemy's *Almagest*.

Researches by W. T. Lynn[2] show that Bayer was indebted for his knowledge of the southern constellations to Pieter Dircksz Keyser. Keyser was

pilot to a Dutch expedition of four ships which sailed to the East Indies in 1595. He did not return, dying off Bantam in Java on 11 September, 1596. Keyser, then, is the forgotten father of Southern Sidereal Astronomy. His twelve southern constellations are: Apis (or Musca) (Bee), Avis Indica (this Bird of Paradise is now obsolete), Chameleon, Dorando (Sword-fish), Grus (Crane), Hydrus (Watersnake), Indus (Indian), Pavo (Peacock), Phoenix, Pisces volans (Flying-fish), Toucan, Triangulum australe. Crux australis (the famous Southern Cross) was not one of Keyser's constellations; it was introduced by Augustine Royer, architect to Louis XIV, in 1679.[3]

The invention of the telescope early in the seventeenth century enabled the position of the stars to be determined with unprecedented accuracy, once Gascoigne (c. 1640) had fitted his instrument with "sights". And in 1718 the great Edmund Halley made a perturbing discovery. Throughout the ages the positions of the stars in the sky had been regarded as "fixed" and permanent. Indeed, Aristotelian doctrine had proclaimed them so. Now Halley discovered that three stars at least had indubitably moved from the positions they had occupied in the heavens some centuries earlier. All the more was it necessary to scrutinize constantly the position of the "fixed" stars. And all the more urgent was the need for an accurate catalogue of southern stars—a scientific prelude, as it were, to the antipodal flow of Western civilization.

Halley himself saw the need. In 1676 he established an observatory on the island of St. Helena; and in 1679 he published a catalogue (*Catalogus stellarum australium*) giving the position of 341 southern stars. This catalogue was, however, of slight scientific value; and Halley's one new constellation (the fatuous and now discarded "Robur Caroli") was an instance of patriotism ousting precision.

Towards the middle of the eighteenth century the need of a southern astronomical station was becoming daily more apparent, and the French Academy of Sciences decided to take steps. But where to locate a station? And who would undertake the pilgrimage? It would mean an exile of years: for an accurate catalogue of southern stars was not the only aim. A southern station, co-operating with an observatory in Europe, could provide new and more precise determinations of the moon's and perhaps some of the planets' distances. It could undertake, by celestial measurement, an investigation into the size and shape of the earth, and so confirm or disprove, what had partly been demonstrated in northern latitudes, that the earth was spheroidal in form. It could solve local problems such as longitude and magnetic variation.

The Academy's choice fell on a brilliant young French priest-turned-astronomer, the Abbé Nicolas Louis de Lacaille (Plate II). Lacaille was

born at Rumigny in the Ardennes on 15 March, 1713. Through the patronage of Jacques Cassini (1677-1756), Director of the Paris Observatory, he obtained employment first in surveying the French coast from Nantes to Bayonne, and then, in 1739, in remeasuring the French arc of meridian (an operation connected with determining the shape and size of the earth). Afterwards, he was admitted to the French Academy of Sciences and was appointed professor of mathematics at Mazarin College, where he was given a small observatory in which he was working at the time of his proposed journey to the south. To exactly what southern locality he should proceed was a matter for deliberation. Why was the Cape selected?

"In those days", Sir David Gill once told a Kimberley audience,[4] "a man armed with so unknown an apparatus as an astronomical instrument was necessarily an object of suspicion . . . A glance at the map of the world will show that in 1751 the Cape of Good Hope was perhaps the only spot situated in a considerable southern latitude which an unprotected astronomer could visit in safety, and where the necessary aid of trained artisans to erect his observatory could be obtained . . ."

If Lacaille was to establish a station at the Cape, it was necessary that the known jealousy of the Dutch authorities should be overcome, that the local officials should be placated and that the French astronomer should be armed with the fullest credentials. For the Honourable Company's administration at the Cape had not forgotten how it once had a bellyful of astronomy. On 11 June, 1705, a certain Peter Kolb[e] had arrived in Cape Town. There he met an Englishman, John Maxwell, who reported to the Royal Society[5] about

> One Mr. Kolbe, who was sent thither by a Prussian Lord the Baron Krosick, who likewise sent another to the northward each of 'em to take observations especially of Coelestial Phoenomena, for the improvement of Astronomy and Natural Philosophy; but Astronomy and Natural Philosophy will not, I believe, be much improv'd by this mission.

Kolbe proved a thorn in the side of the Administration. His whole occupation besides drinking and smoking (it seems from inquiries made by Lacaille), consisted in collecting complaints of the Dutch settlers against the Government (which when sent by other channels had always been intercepted), and forwarding them to Europe.[6] An extract from a Resolution of the Governor of the Cape of Good Hope dated 17 February, 1710, reads:

> The Astronomer, Pieter Colbe, who arrived here in the year 1705, in the ship called the *Unie*, from Holland; and who has for a considerable time been idling about (*deeft ledig beloopen*), without prosecuting his astronomical observations or rendering any burgher-service:— it was thought advisable to demand from him whether he intends remaining here much longer, in which case he will in future be considered as a burgher, and thus become liable to taxes and burgher-duty; otherwise we shall give him his discharge, so that he may return to Europe.

Kolbe elected to stay: "and was for a considerable time secretary to the Court of the Landrost of the Heemraad, at Stellenbosch, where a mass of records in his handwriting still remains."[7] On his return to Europe the publication of his reports resulted in many officers of the Cape Government being recalled and punished.

Would this new astronomer Lacaille prove a second Kolbe, officers at the Cape were bound to ask. And at least Kolbe had been no papist.

So permission for Lacaille to visit the Cape was sought from the Dutch authorities in Holland. On 20 June, 1750, a memorial from the French Academy and other documents (in one place some fool injudiciously mentions Kolbe) requesting that Lacaille be permitted "to proceed to the Cape in order effectually to prosecute his astronomical observations there" were forwarded by the French Ambassador in Paris to the States-General. After deliberation and consultation with the Dutch United East India Company, the needed permission was granted, as an entry in the Journal of the States-General dated 25 November, 1750, testifies:

> After deliberation on the subject, it was thought proper and resolved to permit Mr. De Lacaille, as he is permitted by these presents, to proceed to the Cape of Good Hope for the purpose set forth in the said Memorial. Extract of this Resolution of their High Mightinesses to be sent to the said Representatives and Directors in the Chamber of XVII at Amsterdam aforesaid, in order that the same may be communicated to the Governor of the Cape of Good Hope, and cause them to take such precautions as to prevent any improper use being made of this permission.

Before this formal permission was granted, Lacaille had already embarked on the *Le Glorieux*, Captain Dapres commanding. After calling at Rio Janeiro, the *Le Glorieux* sailed from that port in February, and anchored in the roadstead off Cape Town on 19 April, 1751. Governor Tulbagh's official Journal records the event:

> *Monday*, 19 *April*, 1751: Arrived the French ship *Le Glorieux*, carrying 14 guns and 115 men, which left Port l'Orient on 21st November last year, under the command of Captain D'Apres de Mannevillette, bound to the Island Mauritius, having on board Mr. De La Caille, Member of the Royal Academy of Sciences at Paris, who will remain here for some time, with a view of making Astronomical Observations . . .

Lacaille and Captain Dapres landed at 10 o'clock on the morning of the 20th, and proceeded to pay a ceremonial visit to Governor Tulbagh and his staff. The astronomer handed a letter from the Prince of Orange to the Governor. This letter is preserved in the Cape Archives (*Letters Received*, 20 April, 1751. *See* Plate III):

> *Sir*,—Mr. De La Caille, Member of the Royal Academy of Sciences at Paris, who intends to proceed to, and remain at, the Cape of Good Hope for some-time, with the view of pursuing his Astronomical Observations, having applied to their High Mightinesses for the necessary provision to that effect,—and we being also disposed to comply with the request made to us in that respect by

this gentleman, do therefore hereby recommend him to you, trusting that you will render him such assistance as he may be standing in need of during his temporary residence there.

Commending you to God's holy protection and keeping,
We remain, Sir,
Your well-disposed friend,
Prince D'Orange and Nassau.
By order of His Highness,
In the absence of the Private Secretary,
J. D. Horst.

On the Loo,
17 *October*, 1750.

Governor Tulbagh's reply was prompt:—

Most Illustrious Prince and Sir,—Mr. De La Caille, who arrived here on the 19th of this present month of April, having handed over to me your Highness's letter, dated on the Loo, the 17th October last, I have, in dutiful compliance with the desire therein expressed, not only permitted that gentleman to remain at this place for some time for the purpose of proceeding with his Astronomical Observations, but I shall also not fail to render him such assistance as may be in my power towards bringing that work to a desirable conclusion; of which, I humbly trust, your Highness is fully convinced, as also that I shall ever consider it as the greatest happiness in having an opportunity of subscribing myself, with sentiments of profound respect and esteem,

Most illustrious Prince and Sir,
Your Highness's most faithful, most obedient,
and most humble servant,
R. Tulbagh.

In the Castle of Good Hope,
the 21*st April*, 1751.

Lest there should be any accident in transit, the Governor forwarded his reply in duplicate—one by the ship *Overschré* and the other by the ship *Peregtigheijd*.

While Lacaille was in Cape Town he stayed at Jan Laurens Bestbier's house in Strand Street. Careful investigation by Sir Thomas (then Mr.) Maclear identified Bestbier's house of accommodation as the house occupied in 1838 by a Mrs. de Witt: "the second house in Strand Street, counting westward from the Heerengragth [Adderley Street], on the side next the Bay." "It is", wrote Maclear, "of the description of a good London house"; and he mentions that such distinguished visitors as Sir David Baird, Lord Glenelg and Prince Frederick of Orange had lodged in it.[8] Captain Cook is thought to have been another guest. The house (Plates IV and V) has long been demolished, but a plaque in the wall of a Strand Street shop (Plate VI) now marks the site.

At the sea-end of a courtyard behind Bestbier's house, Lacaille erected a little observatory, and the amount of work he did in it is prodigious. There, in Sir David Gill's phrase, "he laid the foundation of exact Sidereal Astronomy in the Southern Hemisphere".[9] In the course of a single year he determined the positions of no fewer than 9,766 stars. A catalogue of these stars, prepared by him, was published after his too-early death: *Coelum Australe Stelliferum; seu observationes ad Construendum Stellar Australium*

Catalogum (Paris, 1763). On its title-page—inspired no doubt by Lacaille's early religious training—is a quotation from the Scriptures:

> *Laudate Dominum . . . . qui numerat multitudinem Stellarum, & omnibus eis nomina vocat.*

This catalogue for the first time graded the stars of the Southern Heavens according to brightness and added a number of new constellations. Lacaille's names, a little truncated, have been retained by modern astronomers. They are: Apparatus sculptoris (Sculptor's workshop), Fornax chemica (Chemical furnace), Horologium (Clock), Reticulus rhomboidalis (Rhomboidal net), Caela sculptoris (Sculptor's chisels), Equuleus pictoris (Painter's easel), Pyxis nautica (Mariner's compass), Antlia pneumatica (Air pump), Octanis (Octant), Circinus (Compasses), Norma *alias* Quadra Euclidis (Square), Telescopium (Telescope), Microscopium (Microscope), and Mons Mensae (Table Mountain).[10] (See Plate I.)

Lacaille not only charted the southern stars. In 1755 he communicated to the French Academy a catalogue of 42 nebulae in the Southern Hemisphere, observed by him during his visit.[11]

Besides his stellar and nebular observations, Lacaille made careful observations of the moon and planets. He determined with a greater degree of accuracy than ever before the longitude of the Cape. This last work was of considerable practical use to the Dutch Government, for the Cape was the chief port of call on the sea-route to the Dutch possessions in the East. An exact knowledge of its longitude was of such importance in navigation, "and so well understood that it furnished the most powerful argument for smoothing Lacaille's path, and was accepted by Governor Tulbagh as a sound reason for giving Lacaille a hearty welcome, building an observatory for him, and affording him every aid."[12]

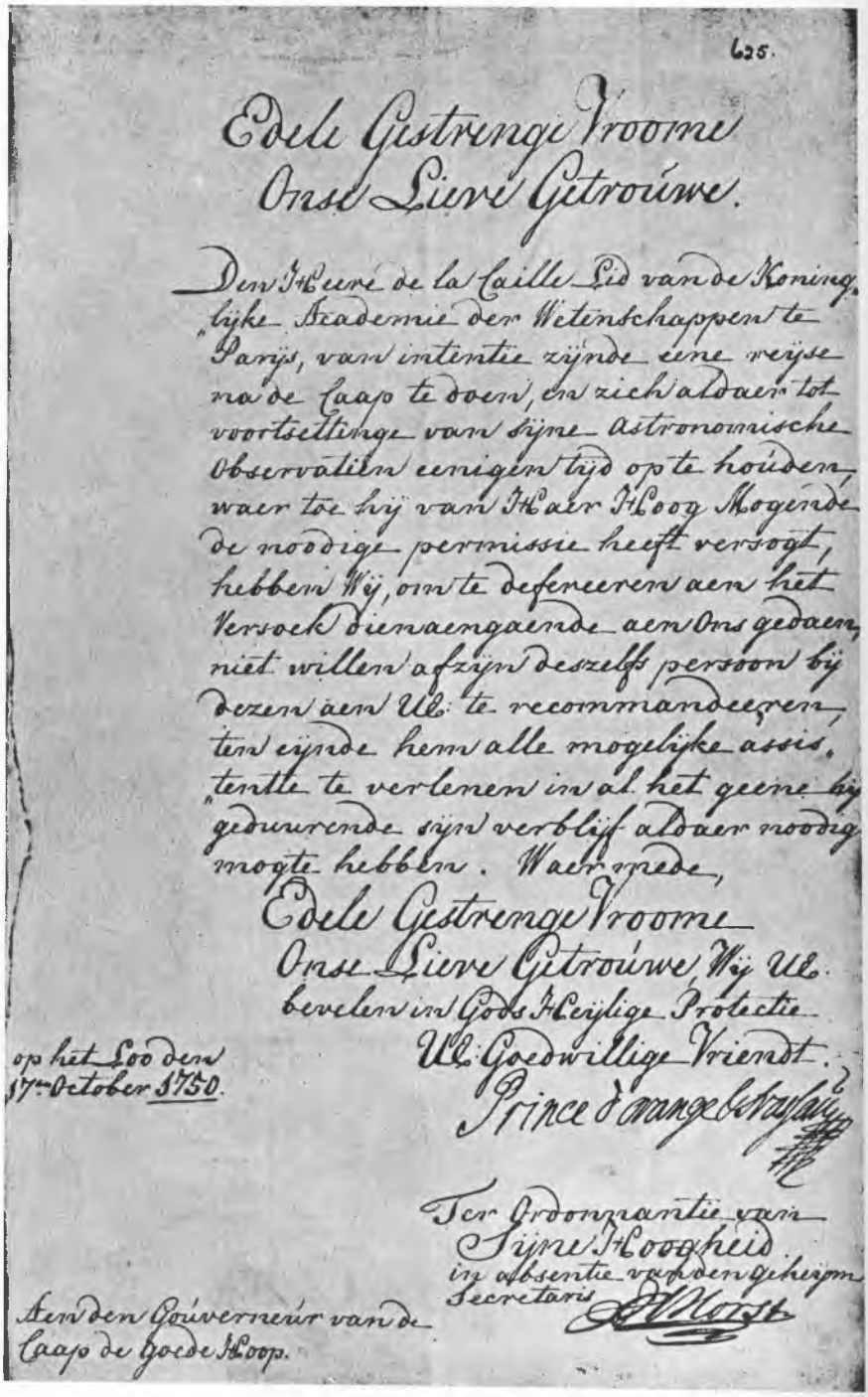
Another service Lacaille rendered the Cape administration was a survey of Hout Bay in June, 1752.[13] He earlier investigated the height of Table Mountain, and the official Journal for 23 September, 1751, records:

> Mr. Abbé De La Caille, who is still at this place pursuing his astronomical observations, having recently taken the height of the Table and Wind Mountains, and of the Lion's Head and Rump, went yesterday, in order to effect the measurement with more accuracy, to the top of Table Mountain, and found the height of the said mountain as follows:—
>
> "The height of Lion's Rump 1102
> „ „ Lion's Head .. .. 2085 } Parisian
> „ „ west corner of Table Mountain .. 3353 }
> „ „ east „ „ „ .. 3302 } feet
> „ „ Windberg 3106
>
> all calculated from the level of the sea; the length of Table Mountain, east and west, being 8346 Parisian feet."

While Lacaille was busy on his star-cata loguing he paid several visit to the country north of Cape Town and saw that it would be comparatively

II. The Abbé Nicolas Louis de Lacaille 1713-1762

Reproduced by courtesy of the Royal Observatory, Cape of Good Hope.



625.

Edele Gestrenge Vroome
Onse Lieve Getrouwe.

Den Heere de la Caille Lid van de Koninglijke Academie der Wetenschappen te Parijs, van intentie zijnde eene reijse na de Caapo te doen, en zich alsdaer tot voortsettinge van sijne astronomische Observatien eenigen tijd op te houden, waer toe hij van Haer Hoog Mogende de noodige permissie heeft versogt, hebben Wij, om te defereeren aen het versoek dienaengaende aen Ons gedaen, niet willen afzijn deszelfs persoon bij dezen aen Ue: te recommandeeren, ten eijnde hem alle mogelijke assistentie te verleenen in al het geene hij gedurende sijn verblijf alsdaer nodig mogte hebben. Waer mede,

Edele Gestrenge Vroome
Onse Lieve Getrouwe, Wij Ue.
beveelen in Gods Heijlige Protectie.

op het Loo den
17e October 1750.

Ue: Goedwillige Vrienden.
Prince d'Orange Betuylaar

Ter Ordonnantie van
Sijne Hooghcid
in absentie van den Geheijm
Secretaris
de Mast

Aen den Gouverneur van de
Caapo de Goede Hoop.

[Cape Archives

III. Letter from the Prince of Orange and Nassau, recommending Lacaille to the Governor of the Cape of Good Hope.

[*Elliott Collection*

IV. Old houses in Strand Street, Cape Town (now demolished).

Lacaille resided in the house on the right. From the roof of the house on the left, Captain (afterwards Sir George) Everest in 1821 measured the distances of points on Table Mountain from Lacaille's southern station.

[*Elliott Collection*

V. Lacaille's sundial in the courtyard of No. 7 Strand Street.

"A brass plate perforated with a small hole, and fixed horizontally on a vertical wall, with a black line traced immediately below it, for the obvious purpose of determining the sun's passage over the meridian, still stands." [1821]—Everest.

[*Elliott Collection*

VI. Memorial plaque on the site of Lacaille's Cape Town station showing his triangulation for measuring an arc of meridian, his observing instrument, etc.

Plaque designed by Sir Herbert Baker.

VII. Lacaille's map of his triangulation for measuring an arc of meridian.
From his *Journal historique*, 1763.

[*Courtesy of H.M. Astronomer, C. of G.H.*

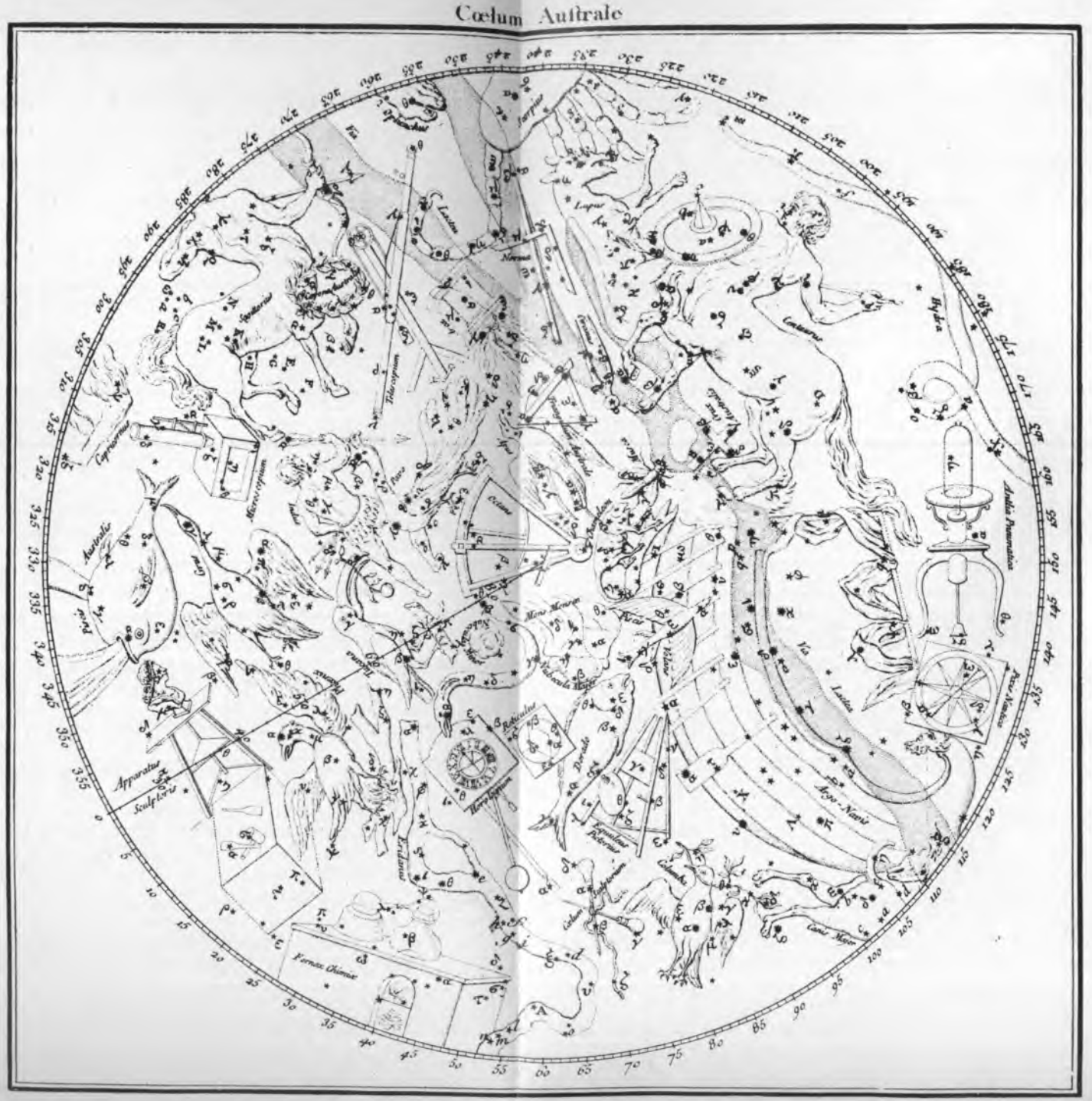
VIII. View from Lacaille's northern point.

"Partrys Berg and the Camp, from Bradley's vector station on the corn floor at Klyp Fonteyn, Piquet Berg." Sketch made by C. Piazzi Smyth in 1842, during the verification of Lacaille's arc.

[*Courtesy of H.M. Astronomer, C. of G.H.*

IX. Another view from Lacaille's northern point.

"Castle Berg, from Lacaille's Granary Station, Klyp Fonteyn, Piquet Berg." Sketch by C. Piazzi Smyth, 1842.



I. Lacaille's chart of the southern constellations, from *Coelum Australe Stelliferum 1763.*

easy to measure an arc of meridian nearly $1\frac{1}{4}$ degrees in length. "Measuring an arc of meridian" means measuring the length of a degree of longitude along the earth's surface. As degrees of longitude are, unfortunately, not marked by nature upon the ground, their position can only be found by astronomical observation; and measurements in the northern hemisphere had shown that a degree of longitude tended to lengthen as the observer approached the North Pole. The earth, it seemed, was not a true sphere but a sphere slightly flattened at its poles—in other words, an "oblate spheroid". Would measurements in the southern hemisphere confirm that this was so?

The problem was of more than theoretical importance to Lacaille. The determination from his Cape observations of the distance of the moon[14] required an exact knowledge of the distance between the latitude of his Cape station and the latitude of the Paris Observatory, with which he was co-operating. To calculate this distance, the true shape of the earth required to be known.

So, his celestial survey completed, Lacaille made a reconnaissance in August, 1752, to select the northern point of his arc, the southern point of which was his observatory in Strand Street. The northern point chosen was Klipfontein, in the mountains north of Piquetberg.

Lacaille set out from Cape Town for Klipfontein on 9 September, 1752. On that date, in Sir David Gill's phrase, "the history of Geodetic Survey in South Africa begins".[15]

Lacaille's survey of his arc is shown in his map reproduced on Plate VII. As this map shows, the survey was made up of two large triangles with the common side Kapoc Berg - Riebeek's Casteel, the northern point being Klipfontein and the southern point Lacaille's station in Cape Town. The measured base-line (shown in the map) was connected with the common side by two smaller triangles.

For the measurement of his base-line (and other assistance) the Governor lent Lacaille some personnel under the command of Captain E. B. Muller, an officer of artillery and the engineer at the Cape fortress. Lacaille was detained for eleven days and nights on Riebeek's Casteel by bad weather and there was a failure to keep the beacon fires at Piquetberg kindled. These delays explain a letter preserved in the Cape Archives from Captain Muller to the Governor, dated 11 October, 1752:

> . . . . I therefore beg you will be pleased to grant me a few days more leave, in order that I may be enabled to fulfil your orders in the measurement of the base-line.

The length of an arc of meridian in 34° South Latitude, as derived by Lacaille, was from the first a subject of perplexity to theoretical investigators of the figure of the earth. His result, wrote Grant, "presented an unaccount-

able anomaly when compared with similar measurements executed on the other side of the equator. It would appear, from the result at which he arrived, that the earth's surface is less curved in the southern than in the northern hemisphere."[16]

The measurement of the arc of meridian completed Lacaille's programme; and the official Journal, Thursday, 8 March, 1753, records:

> This afternoon the French ship *Le Puisieux*, after having saluted and received a contra salute, proceeded on her voyage to Mauritius, having on board Mr. De La Caille, who had completed his Astronomical Observations at this place.

Lacaille's services to southern astronomy were eloquently described to his Kimberley audience (see above) by Sir David Gill. Gill said:

> In the beginning of the present [19th] century our knowledge of the southern heavens, so far at least as these are visible in Europe, rested practically on the observations made during a single year by the Abbé De Lacaille who visited the Cape in 1751. This was one of the most memorable, successful and useful scientific expeditions ever undertaken, and Lacaille himself one of the most earnest and active astronomers that ever lived. Although he died at the early age of forty-nine, Lalande said of him with perfect justice and truth that during a comparatively short life he had made more observations and more calculations than all the astronomers of his time put together. It required a man of such extraordinary energy and enthusiasm to perform the feat of determining with considerable precision for the time, the places of 10,000 stars in a single year. He laid the foundations of sidereal astronomy in the southern hemisphere; he did that great work in a single year at Strand Street in Cape Town; he won the love and friendship of all who knew him; he rendered many scientific services to the Dutch Government of the day, including a survey of Hout Bay, and if ever in this colony we reach that point of civilisation in which the works of our scientific worthies will be commemorated by statues erected to their memory, that of the Abbé De Lacaille has unquestionable claim to be first of the series.

Of Lacaille's work after his visit to the Cape, a brief note may be added. On his return to Europe he resumed his duties in the Mazarin College of Paris, where he proceeded to deduce a number of important results from his observations. "In 1757", writes Grant,[17] "he published a fundamental catalogue of stars, forming one of the most valuable contributions made to science during the eighteenth century. In the following year he published his solar tables, the elements of which were determined with such precision as to leave little further to be desired. These are the earliest solar tables in which the effects of planetary perturbation are taken into

account. He is also the author of a catalogue of about 500 zodiacal stars, which was published after his death.

"The advantages which Lacaille enjoyed in the prosecution of his labours were extremely moderate. He had no assistant to relieve him from a portion of the drudgery incidental to astronomical pursuits, nor were his instruments by any means so perfect as those of some of his contemporaries. By his talents and perseverance, however, he succeeded in overcoming these difficulties; but, unfortunately, he fell a victim to incessant application, when he had only attained an age at which the human constitution usually retains its full vigour. He died on the 21st of March, 1762, in the 49th year of his age."

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Such was Lacaille's high reputation, that for many years after his death, astronomers could not but be perturbed at the apparent discrepancy in the results of his measurement of his southern arc of meridian. To quote Grant again: Lacaille's result "was totally at variance with the theory of gravitation, which assigns the same ellipticity to both hemispheres. On the other hand, the high celebrity of the astronomer upon whose authority it rested, served only to render the question still more perplexing. When Colonel [afterwards Sir George] Everest visited the Cape of Good Hope, in 1821, he carefully inspected the tract of country in which the arc was measured . . . Colonel Everest strongly suspected that the discordance arose from the disturbing influence occasioned by the attraction of the mountains in the neighbourhood of the two terminal stations."[18]

Colonel Everest, (whose "measurement of the meridional arc in India, 11½ degrees in length, is accounted unrivalled in the history of geodesy") strongly advocated the survey of a new series of triangles, extending over a much larger arc. "Such a series", he wrote, "instead of terminating at Kleip Fonteyn, might very easily be carried through the country of the Namaquas to the northern boundary of the colony, which would furnish a very pretty arc of nearly 4 degrees in amplitude, and, I doubt not, set for ever at rest the anomalous hypothesis of the different form of the two opposite hemispheres of the globe."[19]

What Colonel Everest suggested was undertaken practically in full by Sir Thomas Maclear while he was Her Majesty's Astronomer at the Cape.

The field work was commenced in 1838 and continued until 1847. "It is impossible", writes Sir David Gill,[20] "to convey within moderate limits an adequate idea of the indomitable energy and perseverance with which this operation was carried out, of the difficulties surmounted, and of the work accomplished within limited means."

The result of Maclear's verification and extension of Lacaille's arc was to confirm in full what Colonel Everest had foretold. No fault could be found with the careful observations of Lacaille, but mountain masses at his two terminal stations had caused "discordances". There was no irregularity in the spheroidal shape of the earth.

Maclear's results are given in his monumental work *Verification and Extension of La Caille's Arc of Meridian at the Cape of Good Hope* (2 vols. London, 1866), edited by Sir George Airy, then Astronomer Royal. Maclear was helped in his survey by a party of sappers from the Royal Engineers at the Castle, Cape Town, and by two assistants from the Royal Observatory: Charles Piazzi Smyth and William Mann. These, too, have left their records. John Hemming, sergeant of the party of sappers, wrote a quaint account which throws some sidelights on the social life of the expedition. ("A few casualties occurred to the men on the service," he writes. "One man was unfortunately drowned while bathing, and another was lost while in a state of intoxication, by a fall into a deep gully. I got a broken head with a bludgeon from a drunken fellow, but providentially soon recovered."[21]) Piazzi Smyth—afterwards Astronomer Royal for Scotland—has left a series of exquisitely delicate drawings. Two of them, views from Lacaille's most northerly station, are reproduced on plates VIII and IX. Mann's Journal and papers relating to the expedition have been carefully collected and admirably edited by Dr. K. H. Barnard.[22] Six typescripts of this work have been prepared; one of them is in the South African Library.

DONALD McINTYRE

NOTES

[1]See W. Hammond Tooke, *The star lore of the South African natives* (*Trans. S.A. Philosophical Society*, Vol. 5, pt. 2, pp. 304-312, Cape Town, 1893).

[2]W. T. Lynn, *The nomenclature of the constellations near the South Pole* (*The Observatory*, Vol. 9, July 1886, pp. 255 and 256).

[3]W. T. Lynn, *Royer and the constellations* (*The Observatory*, Vol. 9, Sept. 1886, pp. 313 and 314).

[4]Lecture at the Kimberley Exhibition, 5 October 1892. Report in *Cape Times*, 6 October 1892 (reprinted as a pamphlet, *The Cape Observatory*, Cape Town, 1892).

[5]*Philosophical Transactions of the Royal Society of London*, vol. 25, no. 310, p. 2423 et seq.

[8]Nicolas Louis de Lacaille, *Journal historique du voyage fait au Cap de Bonne-Espérance*, p. 317. Paris, 1763.

[9]George McCall Theal, *History of South Africa during the administration of the Dutch East India Company*, Vol. 2, p. 369. Is Theal unduly harsh? Much additional research is needed before a just assessment of the chameleon-like Kolb[e] and his work can be made.

[10]Thomas Maclear, *Verification and extension of La Caille's Arc of Meridian at the Cape of Good Hope*, p. 9. London, 1866. Maclear omits to add that the food at Bestbier's was not so good as it might have been: Lacaille complained that with the best corn in the world Cape Town had the worst bread—the fault of the mills.

[11]Presidential Address, S.A. Philosophical Society, 17 September 1902 (*Transactions*, Vol. 14, pt. 5, p.xl).

[12]Lacaille did not live long enough to reduce all his observations. This work was undertaken under the supervision of Thomas Henderson (H.M. Astronomer at the Cape 1832-33), Sir John Herschel and others, and the subsequent publication of *A Catalogue of* 9,766 *stars in the Southern Hemisphere . . . from the observations of the Abbé de Lacaille . . .* (London, 1847) was financed by the British Association for the Advancement of Science.

[13]*Mémoires de Mathematique et de Physique tirés des Registres de l'Académie Royale de Sciences*, 1755, p. 194 et seq. Lacaille includes *Kappa Crucis* in his Catalogue. Sir John Herschel during his residence at the Cape (1834-38) made repeated observations of this famous cluster (the "Jewel Box"), but could see no trace of any nebulosity (*Results of Astronomical observations made at the Cape of Good Hope*, p. 17 *et seq.*). Yet curiously, Edward James Stone, Her Majesty's Astronomer at the Cape from 1870-1879, records of one of the stars in the cluster: "Nebula: a red star within it observed" (*Cape Catalogue of* 12,441 *stars for the Epoch* 1880, p. 316). This red star appears to have altered in brightness since Sir John Herschel observed it. The whole cluster would have appeared nebulous to Lacaille through his tiny telescope of half-an-inch aperture, magnifying only 8 times. Stone, after compiling his own catalogue wrote: "It is impossible, for me at least, to overestimate the advantages which I have derived from his (Lacaille's) work".

[14]Presidential Address, *op cit.*

[15]*Journal historique*, pp. 171 and 172. Parisian feet are to English feet as 4·263 to 4·000.

[16]Lacaille, *Suite des observations faites au Cap de Bonne-Espérance, pour la parallexe de la lune, avec un sextant de six pieds de rayon* (*Mem. Acad. de Sciences*, 1751, p. 310 et seq., Paris, 1755).

[17]David Gill, *On the geodetic survey of South Africa* (*Report of the Sixth International Geographical Congress, held in London*, 1895, p. 341, London, 1896).

[18]Robert Grant, *History of physical astronomy from the earliest ages*, p.147. London, 1852.

[19]Grant, *op. cit.*, p. 486.

[20]Grant, *op. cit.*, p. 147.

[21]Letter from Capt. George Everest to Lt.-Col. Wm. Lambton, dd. 31 Aug. 1821 (published in *Memoirs of the Astronomical Society of London*, Vol. 1, pt. 2, pp. 258-70). Everest adds: "In no country indeed, could a datum of this nature and equal importance be obtained with less personal toil and suffering to the individual engaged in it; for the climate is perhaps without a parallel on earth, the face of the country presents no appalling difficulties, and there is a degree of hospitality and readiness to oblige on the part of the colonists in general, which would render a sojourn among them highly pleasing and satisfactory".

[22]David Gill, *A history and description of the Royal Observatory of the Cape of Good Hope*, p. xxii. London, 1913.

[23]*Papers on subjects connected with the duties of the Corps of Royal Engineers.* Vol. 1, New Series, p. 36. London, 1851.

[24]K. H. Barnard, *William Mann* (1817-1873) *of the Royal Observatory: some incidents*

in the life of an astronomer-mountaineer while engaged on the verification of Lacaille's arc of meridian. Mann relates how he found the remains of Lacaille's signal fire on the summit of Riebeeck Kasteel and brought away a piece of charcoal as a memento. This piece of charcoal is still preserved at the Royal Observatory, Cape of Good Hope. Besides the works mentioned in the text, a lucid description of "Earth measurements" in general and the verification of Lacaille's arc in particular, written by Sir Thomas Maclear, may be found in *The Cape and its people* (various authors, Cape Town, 1869).

N.B. The illustrations in the text on pages 86 and 87 *supra* are reproduced from sketches in Lacaille's *Journal historique*.