De la Caille at the Cape

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When de la Caille came to South Africa he was an established astronomer, having been on the staff of the Paris Observatory, where he fixed the position of a number of fainter stars. His first year's work at the Cape was to fix the position of some nine and a half thousand southern stars. David Evans, once second in charge of the Royal Observatory at the Cape, suggested the patronymic 'Father of Southern Astronomy'. I would offer him also the title 'Father of Southern Geodesy'. But whereas Sir Thomas Maclear, who 90 years later checked la Caille's triangulation, was a medical doctor turned astronomer and an amateur in the field of land surveying, la Caille had a great deal of surveying experience in France. He was really a professional surveyor as well as an astronomer.

When the French navy wanted a map of the Mediterranean coast of France, la Caille was involved with the team which did the work. Similarly, when a map of the Biscay coast was wanted, la Caille was again involved. When the French wanted a map of the coast along the English Channel he was again part of the team.

The survey of France had begun before his time and the main grid was a series of some 60 odd triangles stretching from Perpignan on the Mediterranean coast in a due north direction to Dunkirk close to the Belgian border. Under severe weather conditions, which were to shorten his life, he reobserved all the triangles in the chain from Perpignan to Paris. He also helped in remeasuring the original base on which the whole grid is based, and was involved in at least the measurement of a subsidiary base. What better training could he have had for his work at the Cape? When the Academy of Science wanted someone to do their work

at the Cape, they must have been delighted to have the services of such an experienced professional in both fields of endeavour.

While he is popularly known as the Abbé de la Caille, neither of his two modern biographers suggest that he is entitled to that appellation. Moreover, the late Cardinal Owen McCann assured me that he had searched the records in Paris and that la Caille was not an ordained cleric. Jim Smith points out that though he did first study theology, his love for mathematics was too strong and it was as a mathematician that he made his life's work.

Born in Alsace, he may well have had some German as well as French, but would have had no knowledge of the Dutch language. In fact at the Cape he made use of an interpreter. But why come to the Cape?

By measuring the difference in latitude between his southern and northern stations in France, he had the angle that these points subtended at the centre of the Earth between these points, and knowing the north-south distance on the surface as derived from triangulation, it was possible to calculate the radius of the Earth at the mean latitude of the chain. The French were also involved in a similar exercise in Lapland and another in Peru and were thus able to prove that the Earth was an oblate spheroid, as Newton had predicted that a spinning liquid should be. This was in fact the exact opposite of what they set out to do. If an English scientist said something, the French felt it necessary to say the opposite. But there remained one unanswered question. Would the radius south of the equator be in sympathy with the northern determinations? There were two alternative ways to answer the riddle. Do similar work in either Africa or South America. Through the office of the Netherlands ambassador in Paris it was arranged that de la Caille was given permission to visit the Cape to map the southern sky. The radius measurement was apparently not mentioned. So when he traveled to the Cape he carried letters of introduction from both the Prince of Orange and the Here Sewentien. These were to ensure him excellent co-operation. In France he was one of a team; at the Cape he was on his own. He was also in a country where he did not know the language and needed an interpreter.

In November 1750 la Caille embarked at l'Orient for his mission to the Cape. Two months later his ship put into Rio de Janeiro so that an accompanying vessel could be repaired and the pair spent a month there. This delay must have irked the energetic astronomer but he used the time to determine the position of the port and also to meet one of the Goldins, who were involved in the eight year survey in Peru, where an arc of meridian was measured. No doubt this too would prove valuable knowledge when he was to do similar work at the Cape. He also observed the magnetic variation and the length of the seconds pendulum. This latter experiment he was of necessity to perform also at the Cape. The Cape was sighted on 30 March 1751 but adverse winds resulted in the ship only entering the Bay on 19 April, and he came ashore the next day. He must have had some anxious moments as the instruments were lowered into a small boat and then taken ashore through the surf at Rogge Bay.

He contacted Ryk van Tulbagh, the Governor, and was well received, thanks to the letters of introduction, and was quartered on the property of Mr Bestbier. About ninety years later Sir Thomas Maclear searched the Deeds Office and found that there was only one property in the town owned by a Best-

bier at the time and thus was able to establish where the observatory was built. The present Strand Street was the nearest street to the sea and Bestbier's house was built in the Dutch style with the front of the house right on the front boundary of the erf. Behind it, that is on the sea side of the house, la Caille built his observatory. Material had been supplied by the Governor. In less than a month after landing he had a completed building about 4m square. Now he had to determine the exact bearing of the meridian using mostly star positions from the catalogues of stars visible from the north. He had also to determine the length of the pendulum so that it would beat in true seconds and only then could he begin to take observations to fix the southern stars. He also had to take observations to fix his own latitude. Moreover he had to calibrate the graduations on his sector. With only parts of the southern sky being covered by the classical constellations, it was also necessary to fill the gaps by naming new ones and defining their limits. These numbered 14 and the one of most significance to a Capetonian is Mons Mensa (abbreviated some time back to Mensa), placed by de la Caille next to the Greater Magellanic Cloud, no doubt having seen the south-east cloud so often on Table Mountain.

For about a year la Caille concentrated on fixing the position of the nearly ten thousand stars on his list and then began the second task. As a land surveyor who has had to work in unfamiliar territory I am full of admiration for a stranger to this country who, without the aid of any maps, had to choose a means to find the distance between two points on the same meridian as far apart as reasonably possible and without at the start knowing anything about the intervening countryside.

To do a reconnaissance of the countryside he went up Table Mountain, no doubt with a magnetic compass, to enable him to get an idea where he would need to fix his northern station, and also where he would have to site both the base and the two points he would have to survey from the ends of the base. But in the end he would have to have selected the base on the ground. That meant he had to select a base some 12.6 kilometres in length with the ends inter-visible and with gentle slopes between them. There must also be no dongas on the line as he had to lay the rods end to end horizontally. How to do this in an unknown area where tracks would have been at a minimum, and where his requirements would have had to be relayed to the farmers through an interpreter? The site of the base in the valley north east of Darling and Riebeeck Kasteel was an obvious choice because its height meant it would be clearly identifiable from the observatory in Cape Town. Kapokberg, much lower, would have been less obvious. For his northern station he selected a point at the foot of the Piketberg mountain rather than on high ground so that the transport of his equipment would have been relatively easy. On the other hand, sighting a low point from either of the high points when it came to taking the observations would be difficult. Any surveyor will underline this comment.

The points selected would have to be easily recognizable and particularly difficult would have been the northern station with the mountain background. The whole operation would have been a surveyors nightmare. Near the Observatory there was a white pillar to which he observed, and he would had to have applied a reduction to centre so as to correct the direction to be as if he had observed to the telescope itself. So

too would he have needed a correction when he observed a rock on Kapokberg or on Riebeeck Kasteel, when he measured the angles, not from these rocks, but from an eccentric point nearby. Then too his quadrant measured angles, not in a horizontal plane, but on a slightly tilted one necessitating a further correction. His experience in this type of work in France would have stood him in good stead in all these respects. But the lighting of fires at particular times at distant points, with no communications, would also have proved a difficult logistical problem.

Unfortunately, he did not allow for the fact that his station near Aurora was so close to the mountain at Picketberg, that the plumb line did not hang truly vertical, and this induced a latitude error which, though his work was otherwise good, meant that he compared a correct distance between the two points with a difference in latitude that was some 8 seconds of arc in error. This resulted in a determination of the Earths radius which was more or less the same as in a higher latitude in France when it ought not to have been so. Nearly a century later Maclear sorted this out and in doing so, began a triangulation of South Africa which would later extend through the territories to the north, and which with the coming of the telurometer, a South Africa invention, would eventually link up with the Egyptian system.

While in Paris la Caille had observed stars on the meridian at high altitudes. As Paris is at 49° north and Cape Town at 34° south, a star transiting at the zenith in Paris would be only 7° above the horizon when transiting at Cape Town. As the zenith observations would be free from refraction errors and the ones near the horizon would include such errors, it was thus possible for la Caille to get a very good idea of the value of refraction at low altitudes. He did this for a number of stars.

Working in conjunction with astronomers in the north, he did work to determine the solar and lunar parallaxes and took observations of eclipses of Jupiter's moons. His work had many sides – a truly great astronomer.