Lacaille, Nicolas-Louis De | Encyclopedia.com

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(*b*. Rumigny, near Rheims, France, 15 March 1713; *d*. Paris, France, 21 March 1762)

astronomy, geodesy.

The Abbé Lacaille was an immensely industrious observational astronomer whose career was climaxed by a scientific expedition to the Cape of Good Hope; his studies there made him “the father of southern astronomy,” and his names for fourteen southern constellations remain as his most enduring monument.

His father, Louis de la Caille, was originally a gendarme and later served in various artillery companies; his mother as Barbe Rubuy. Both parents were descended from old and distinguished families; but since Lacaille believed that merit rested in the individual and not in his ancestors, he made no attempt to investigate his lineage.

The elder Lacaille recognized his son’s scholastic ability and arranged for his education, first at Nantes and then, beginning in 1729, at the Collège de Lisieux in Paris. For two years the young Laacaille studied rhetoric, acquiring his lifelong habit of wide reading. The death of his father left him without resources; but his pleasant personality, hard work, and intelligence had impressed his teachers and it was arranged for the young man to receive support from the duke of Bourbon, an acquaintance of his father’s. Sometime during this period he received the title of abbé, although he seems never to have practiced as a clergyman. After completing the course of philosophy, Lacaille transferred to the three-year theological course at the collège de Navarre. There, by chance, he discovered Euclid and soon developed a keen but secret interest in mathematical astronomy, a subject in which he had no teacher and scarcely any books. he passed the examinations for the master’s degree with honors; but at the traditional ceremony for conferring the hood Lacaille answered an already obsolete question of philosophy in a way that offended the vice-chancellor, who refused to award the hood. When the other examiners objected, the degree was grudingly given. Although Lacaille had seemed destined for literature, the incident at his graduation fortified his resolve to study the mathematical sciences. Thus, rather than apply for the bachelor of theology degree, he spent the money on books.

In 1736 Lacaille contacted J.-P. Grandjean de Fouchy, soon to become permanent secretary of the Academy of Sciences, who was astonished at the young man’s progress in astronomy in the absence of any formal teaching. Fouchy introduced Lacaille to jacques Cassini, the leading astronomer at the observatory in Paris; and thereafter Lacaille received lodging there. He made his first astronomical observation in May 1737.

Throughout the eighteenth century, problems of geodetics were closely linked with astronomy, especially because of the growing requirements of navigation. Thus Lacaille was assigned the mapping of the seacoast from Nantes to Bayonne, and in May 1738 he left Paris with G.-D. Maraldi. Then, because of his demonstrated ability, he was assigned with Cassini de Thury to the verification of the great meridian of France, which extended by a series of triangles from Perpignan in the south to Duckerque in the north. At that time the shape of the earth was the source of great controversy between the Cartesians and the Newtonians. Cassini actively defended the opinion that, according to the French geodetic measurements, the earth was a prolate spheroid, contrary to Newton’s view of the earth with an equatorial bulge.

Lacaille took the leading role in the new measurements. He measured base lines at Bourges, at Rodez, and at Arles; and he established positions astronomically at Bourges, Rodez, and Perpignan. During the rigorous winter of 1740 he extended his triangles to the principal mountains of Auvergne in order to ti3e in with another newly measured base line at Riom. Soon he was able to improve Picard’s measures of 1669, showing that Picard’s base line near Juvisy was 1/1,000 too long. Lacaille’s geodetic and astronomical measurements, continued north of Paris until the spring of 1741, enabled him to show that the degrees of terrestrial latitude increased in length toward the equator, a result in agreement with Newtinion theory but directly opposed to previous French results.

Because of his growing reputation, the twenty-six-year-old Lacaille was named, during his absence on the survey, to the chair in mathematics once held by Varignon at the Collège Mazarin. Two years later, in May 1741, in recognition of his work on the meridian and his resolution of the controversy over the shape of the earth, he was received into the Academy of Sciences as an adjoint astronomer. Once again in residence in Paris, he took his professorial duties seriously, publishing *Leçons élémentaires de mathématiques* in 1741. The prompt translations into Latin, Spanish, and English were an eloquent compliment to his book, which was destined to go through several French editions as well. In succession other elementary texts followed: *Leçons élémentaires de mécanique* (1743), *Leçcons élémentaires d’ astronomie géomeétrique et physique* (1746), and *Leçons élémentaires d’optique* (1756). These works were also translated into Latin and other foreign languages. In the same period Lacaille began the computation of the series *Éphémérides de mouvements célestes*, which eventually extended from 1745 to

1775; these were later continued by Lalande to 1800. Another impressive testimonial to his computational ability and intellectual discipline was his calculation of all the eclipses from the beginning of the Christian era through the year 1800 for the encyclopedic *L'art de véfifier les dates*; this he accomplished in five weeks, working fifteen hours per day. Because the work was done so quickly, the authors of the compendium assumed that Lacaille had calculated the eclipses long before and had merely recopied the tables.

In the 1740's Lacaille left his lodging at the Paris observatory, and in 1746 a new observatory became availabel for him at the Collège de Lisieux. Here he recorded a vast variety of celestial phenomena, including conjuctions, lunar occultations, and comets. The abbé Claude Carlier called him"an Argus who saw everything in the sky," Most important, at the Mazarin observatory he exploited transit instruments, which were scarely known and appreciated in France at the time.

Curiosity about the souther stars invisible from the latitude of Paris induced Lacaille to propose an expedition of the southern hemisphere. An endorsement was offered by the Academy of Sciences, which ensured government support; and on 21 October 1750 he departed from Paris on his southern journey. On 21 November he embarked on the *Glorieux*, a ship so badly constructed that it was necessary to stop at Rio de janeiro (on 25 January 1751) to repair the leaks. The ship left Brazil a month later, arriving at the Cape of Good Hope on 30 March 1751; but the passengers were unable to disembark until 19 April. Lacaille was cordially received by the Dutch governor of the Cape and sent to lodge in one of the best houses of the town. his observatory, built in the yard, consisted of no more than a small room measuring about twelve feet square and erected on a heavy masonry foundation. In this room Lacaille had tow piers for carrying instruments, a pendulum clock, and a bed. He had two sectors, each with a six-foot radius, one of them carrying two telescopes; a smaller quadrant; and a variety of telescopes, one fourteen feet long (which he used for observing Jupiter's satellites).

In seeking the support of the Academy, Lacaille had proposed to make observations for the determination of the paralaxes of the sun and moon, to determine the longitude of the Cape, and to chart all of the southern stars to the third or fourth magnitude. In spite of wretched seeing conditions caused by the southeast wind that blew steadily nearly half the year, and often made the stars look like comets, Lacaille far exceeded his planned program of observations.

Trigonometrical determinations of the distance to the moon or the scale of the solar system generally require as large a base line as possible. The Cape of Good Hope was ideally situated for parallax measurements because although it was far from Europe, it had the same longitude. While Lacaille made his observations at he Cape, simultaneous measurements were undertaken in Europe. It was on this occasion that the nineteen-year-old Lalande made his own astronomical reputation by observing the other end of the parallactic base line from Berlin. Lacaille observed for the lunar parallax from 10 May 1751 until October 1752. Observations for Venus were secured between 25 October 1751 and 15 November 1752, and for Mars from 31 August 1751 until 9 October 1751, while that planet was at a relatively favorable opposition. The value that he obtained for the solar parallax was 9.5 seconds of arc instead of 8.8 seconds, thus making the sun—earth distance roughly 10 percent too small.

When charting the southern skies, Locaille's response to the bad seeing conditions was to use a small eight-power telescope, only twenty-eight inches long and one-half inch in diameter. In the field of this instrument he mounted a rhomboidal diaphragm. The telescope was rigidly attached to the mural quadrant so that it pointed to a chosen spot on the north—sount meridian. As the star in the 2.7-degree zone drifted through his field in their daily motion, Lacaille recorded the times when they entered and left the fhombus. The average of the two sidereal times for a star gave its right ascension, while the difference of the times was a function of its declination. With this instrument in the year beginning August 1751 he undertook 110 observing sessions of eight hours each, plus sixteen entire nights. in this fashion he mapped nearly 10,000 stars in the southern sky, an incredible achievement. Lacaille himself reduced the positions for only 1,942 of these stars for a preliminary catalog, and not until the 1840's was the entire catalog reduced in Edinburgh by Thomas Henderson and published under the direction of Francis Baily as *A Catalogue of 9766 Stars in the Southern Hemisphere* (1847). The magnitude of Lacaille's accomplishment can be compared with the only previous systematic attempt to map the southern skies, by Edmond Halley, who from the island of Saint Helena in 1677–1678 had cataloged 350 stars. Lacaille carried out his program in spite of continued fevers, rheumatism, and headaches exacerbated by his intemperate schedule.

In the work Lacaille completed the naming of the southern constellation, which had been begun by Dutch navigators around 1600. As an astronomer of the Enlightenment, Locaille eschewed the mythology of classical antiquity and named his fourteen new constellations after modern tools of the arts and sciences: Sculptor, Fornax, Horologium, Reticulum Rhomboidalis, Caelum, Pictor, Pyxis, Antlia, Octans, Circinus, Norma, Telescopium, Microscopium, and Mons Mensa. Among these, the names of several of Lacaille's instruments take a prominent place.

A by-product of Lacaille's zone surveys was a catalog of forty-two nebulous objects. In describing this result to the Academy, Lacaille wrote:

The so-called nebulous stars offer to the eyes of the observers a spectacle so varied that their exact and detailed description can occupy astronomers for a long time and give rise to a great number of curious reflections on the part of philosophers. As singular as those nebulae are which can be seen from Europe, those which lie in the vicinity of the south pole concede t them nothing, either in number or appearance [*Mémoires de ol'Académie royale des sciences* (1755)].

The detour in the original journey to the Cape, plus the six weeks' delay while the observatory was being built, prevented Lacaille from completing his objectives within a year, as he had originally planned. Consequently, he extended his visit, which gave him more than enough time to meet the geodetic objective of his expedition. With assistance offered by the governor of the Cape he surveyed theree-quarters of a degree along a north-south meridian. His eight-mile base line encompossed his observatory and a number of mountain peaks in the vicinity of Cape Town. Lacaiile was troubled to find that his results supported the hypothesis that the earth was a prolate, not an oblate, spheroid. Although he partially rechecked the result, he could find no error and it remained a puzzle for some years. Apparently the result was due to the deviation of the plumb line at his southern station caused by the large mass of Table Mountain (the Mons Mensa of his constellation list).

While at the Cape, Lacaille collected many plants unknown in Europe for the royal botanical gardens in Paris. In addition he sent a great numbers of shells, rocks, and even the skin of a wild donkey to the cabinet of the royal gardens. His observations of the customs of"Hottentots and inhabitants of the Cape of Good Hope" were published posthumously in his *Journal historique du voyage fait au Cap de Bonne-Espérance* (Paris, 1776).

Before his return to France, Lacaille received instruction to establish the positions of two French islands in the Indian Ocean, Ile de France (Mauritius) and Ile de Bourbon (Réunion). He left the Cape for Mauritius on 8 March 1753 on the *Puisieulx*; en route he worked on the problem of determining longitude at sea from observations of the moon. He arrived on 18 April 1753 for a nine-month visit, during which he continued his astronomical observations as well as mapping the island. The following January he sailed to St,-Denis of Réunion. On 27 February 1754 he left on the *Achille* for France, stopping for five days in April on Ascension Island, whose position he determined. Lacaille arrived in Paris on 28 June 1754, after an absence of three years and eight months.

Upon his return to Paris, Lacaille found lavish praise awaiting him—he was even compared to a star returning to he horizon. With great modesty he refused all the fanfare. He wanted only to retire quietly to his observatory to reduce his observations; in fact, he dreamed of retiring to a southern province where he could once again observe the southern skies. He accepted an annual pension from the Academy but rejected all other means of advancing his fortune. Nevertheless, his fame spread and he was welcomed into membership in the academies of Berlin, St. Petersburg, Stockholm, Göttingen, and Bologna.

In 1757 Lacaille published *Astronomiae fundamenta*, a work now very scarce, apparently because it was privately distributed by the author in an edition of perhaps 120 copies. The book had two parts: the first contained tables for the reduction of true positions of stars to their apparent position. In the second part of his work Lacaille gave the positions of 400 of the brightest stars. Appended to the work were observations of the sun made at the Cape and on Mauritius. The following year he published his detailed tables of solar position; these included the effect of perturbations from the moon, Jupiter, and Venus. Another important contribution from his southern expedition was an extensive table of atmospheric refraction, showing the effects of both temperature and barometric pressure.

In this period Lacaille not only edited revisions of his own textbooks but also brought out a throughly revised edition of Bouguer's *Nouveau traité de navigation* and edited from manuscript Bouguer's *Traité d'optique sur la graduation de la lumière*. He initiated a project to be entitled *Les âges de l'astronomie*, in which he proposed to assemble and compare all the old astronomical observations, a work which later found partial fulfillment in Pingre's *Annales de l'astronomie*.

Lacaille's memoir on the Comet of 1759 (now known as Halley's Comet) not only described his particularly careful observations but also afforded the occasion to demonstrate his simplified method for finding the elements of a cometary orbit. Besides the observations that he regularly to the Academy, he made many other for his own star catalog. In 1760 he organized a plan to measure very accurately the positions of a number of zodiacal stars, and Lacaille's biographers are unanimous in attributing his early death to the rigors of his observational program. Not only did he spend many arduous hours observing the heavens; he even slept on the floor of the observatory. At the end of February 1762 the symptoms that he had previously suffered at the Cape returned; rheumatism, nosebleeds, and signs of indigestion. Teh doctors imposed the standard bloodletting procedures of the day, apparently notrealizing the seriousness of his illness; and after an attack of particularly high fever, he died. He was only forty-nine.

Lacaille's deeply sincere modesty, his profound honesty, and his sustained devotion to his science impressed all who knew him. A younger colleague Lalande, wrote that he had single-handedly made more observations and calculations than all the other astronomers of his time put together. Delambre added that although Lalamde's statement appeared to be an exaggeration, it was literally true if only the twenty-seven years of Lacaille's astronomical career were considered.

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