

Astronomical Observations on the River Niger Exploration

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Expeditions to deepest Africa by Mungo Park and the Lander brothers included observations of the Sun and the moons of Jupiter to determine latitude and longitude. Their observations and commentary from their Journals provides an interesting insight into exploration in the early 19th Century.

Towards the end of the eighteenth century in London, a very small group of wealthy influential gentlemen formed an Association for Promoting the Discovery of the Interior Parts of Africa – the ‘African Association’ – and a subscription was levied on members which was to be used where possible to maintain at least one explorer in the field undertaking scientific studies. The Association was particularly keen to get an explorer to reach Timbuktu in central Africa, a city reputedly paved with gold, and to discover the course of a great river, the Niger, about which almost nothing was known. The first expeditions sent out by the Association were not entirely successful, and as they had all started either in the north or the east of the continent it was decided to begin the next exploration on the west coast. The man chosen to undertake this approach was Mungo Park, a young Scottish surgeon who had been befriended by Sir Joseph Banks, the Association’s pre-eminent member. Park had already forsaken medicine for the greater excitement promised by exploration – and the greater financial reward.

Park went to Africa in 1795 and began his journey by travelling up the River Gambia for about 200 miles, then striking eastwards across unknown territory hoping that he would reach the Niger, which he did at Segou, in present-day Mali. Somewhat to his surprise, he immediately noticed that the river flowed from west to east, and not in the opposite direction, as had been thought, even by Park himself. Park followed the river for a few miles downstream, but then realised that he was not going to get much further; he was weak and had exhausted his provisions. He returned to Gambia, and arrived back in London in 1797. Park’s expedition had only limited success, and the map-makers were disappointed that accurate determinations of latitude and longitude had not been made.

Park was keen to go back to Africa, but the Association had no immediate plans for him, so he returned to Scotland, married, had children, and practised as a doctor. Then, in 1803, a major expedition to the Niger was proposed with the primary aim of opening up trade routes; purely

scientific exploration was to be a secondary consideration. Park was to lead the expedition, which would be about fifty strong, including a detachment of thirty soldiers. The cost of such a large party was too much for the pockets of the Association members, so the government agreed to foot the bill. However, when Park was almost ready to leave there was a change in government and the expedition was delayed. The Association suggested that Park should take the opportunity to study Arabic and familiarise himself with astronomical calculations that he could use to determine his position. Park had acquired some knowledge of Mandingo, the language he had found to be most prevalent during his first expedition, but he had noted a fairly widespread use of Arabic, and it was thought that knowledge of Arabic would be of significant advantage. Arabic had been introduced into the area by Moorish traders, who, as Park noted, also introduced ‘Mahomedanism’, which had become widespread.

The expedition finally got under way in 1805, and the plan was for the party to follow a similar route to that taken by Park on his first expedition. On reaching the Niger, the carpenters in the party were to build boats in which they would all sail down the river to its unknown end. Park believed that they would eventually join the Congo, while others believed that the Niger ran into the Nile, and some thought that it ended in a lake. Of course, they were all wrong.

In the surviving journal of the first part of the expedition, published posthumously, Park records twenty-five astronomical observations made between 15 May and 17 September. His instruments included a sextant, watch, compass and telescope, and he had a copy of the *Nautical Almanac*. He observed the Sun, the Moon and Jupiter to find his latitude, and Jupiter’s satellites to correct his watch; Jupiter’s satellites were easy to see with a telescope, and the times of their immersions and emersions were tabulated in his Almanac. The majority of the observations recorded in the journal are of the meridional altitude of the Sun, for which he used a Troughton’s pocket sextant, and very early in the

expedition he had this to say about the instrument:

[E]ndeavoured to take the meridional altitude of the Sun, by the back observation with Troughton's pocket sextant; and after carefully examining his rise and fall, with the intervals betwixt each observation, I was convinced that it can be done with great accuracy, requiring only a steady hand and proper attention. This was a great relief to me; I had been plagued watching the passage of the fixed stars, and often fell asleep when they were in the meridian.

Park and his party left Gambia on 27 April, and it was almost a month before he began to record observations. A typical calculation of the latitude involved determination of the meridional altitude of the Sun, incorporating a value of 32 minutes for the Sun's diameter. The zenith distance was thus obtained, and this value was subtracted from the declination given in the *Almanac* to determine latitude. The first calculation came up with a latitude of 14° 4' 51" N, and the numerous calculations that were recorded in succeeding weeks all resulted in a value between 13 and 14 degrees north. The expedition was heading almost due east.

The first recorded use of the telescope was on 16 May, when Park observed an immersion of Jupiter's first satellite, Io. He noted the time of the immersion by his watch, found the predicted time in the *Almanac*, and subtracted the equation of time to obtain the mean time at Greenwich. Subtracting this time from his watch time he arrived at the result that his watch was 3 minutes 35 seconds fast. He commented: 'it is difficult to account for such a difference in the rate of going of the watch in the course of one month, but the excessive heat and the motion of riding may perhaps have contributed to it; I think my observation of the immersion was correct.'

The telescope was used again on a few occasions, as Park records:

26 May. During the night got the telescope ready in order to set the watch to Greenwich time by observing an emersion of the second satellite of Jupiter. Mr. Anderson took the time, and I was seated at the telescope half an hour before it happened, in order to be sure of observing it. The satellite emerged by

	H	M	S
Watch	11	49	16
Mean time at Greenwich	11	46	30
(Almanac time – equation)	<hr/>		
Watch too fast	0	2	46

Observations of the Sun taken with artificial horizon the same evening to determine the apparent time.

(He does not record what the time was, or what he did with it, but he presumably used it to compare it with Greenwich time and so obtain his longitude).

26 June. Observed the emersion of the first satellite of Jupiter.

	H	M	S
Watch	9	26	20
Mean time at Greenwich	9	27	8
(Almanac time – equation)	<hr/>		
Watch too slow	0	0	48

(Park again took altitudes of the Sun for the time, and quotes a longitude of 8° 6' W, but does not give his method of derivation.)

27 June. We could not sleep with the noise of the hippopotami, which came close to the bank and kept snorting and blowing all night. The night being clear, observed the emersion of Jupiter's second satellite. Calculated the watch to be 38 seconds slow.

2 July. Neglected to wind up the watch.

19 July. Observed the following emersion of Jupiter's satellites:

	H	M	S
Third satellite emerged by watch	9	25	18
Watch too slow	0	1	55

First satellite emerged by watch	9	36	10
Watch too slow	0	2	34

(Altitudes of the Sun for the time were again taken, and a derived longitude of 5° 0' 13" W calculated.)

These were the last observations of Jupiter's satellites recorded in the journal, and Park does not comment on the fact that in 11 minutes his watch had apparently lost 39 seconds. The reason for this discrepancy is clearly the difficulty in exactly timing the emersion, or immersion, of the satellites.

Park continued to derive his latitude by observations of the Sun until the last recorded entry on 17 September, and at the very end of the surviving

journal he notes:

In case any one should be inclined to doubt the accuracy of the latitudes taken by the back observation with Troughton's pocket sextant; I think it proper to mention that I have observed at Sansanding alternately with the horizon of the river, and the back observation in water, and the artificial horizon; and never found them to vary more than four minutes, but generally much nearer.

Park had reached Segou on his first expedition, and he arrived there again on 17 September with very few members of his party left. Malaria and dysentery were the great killers. It was 16 November before they were ready to continue downstream, and before leaving Park asked one member of the party to take his journal back to Gambia. That left just eight surviving members who took to the water. Details of subsequent events rely on the eye-witness account of a local interpreter who was in the canoe. He notes that they travelled several hundred miles, apparently antagonising all the local inhabitants, and when they reached Boussa, where the river narrowed, they were attacked. Park and five others were killed or drowned in early 1806. The interpreter and one slave survived. All of Park's possessions were thrown into the river, and only one or two items were ever recovered; journals written by Park after he left Segou were never found.

Park did not solve the mystery of the Niger, and it was not solved until another quarter of a century had elapsed. Richard Lander was the man chosen to determine finally the course of the Niger. He was the obvious choice because he was the only surviving explorer with experience of travelling in that part of central Africa.

He was also a good choice as far as the Colonial Office was concerned. The Colonial Office had taken over the financing of expeditions, and sending Lander out on his own was not going to cost very much. Unlike Park, Lander had no friends in high places; he was of humble origin, and although he did receive a small sum for his services, his brother John – who, it was agreed, could join the expedition – received nothing. It was one of the cheapest expeditions to leave these shores, and it was one of the most successful.

The brothers began their journey at Badagri, near present-day Lagos. They travelled north-eastwards to Boussa, then canoed down the Niger to the sea. However, it was not quite as simple as that: they had to overcome the usual dreadful illnesses, and many life-threatening hazards on the way. The only instruments they took with them were a watch, a compass and a thermometer, so they made no astronomical observations; but on the night of 2 September 1830 an astronomical event occurred

which was recorded as follows by John Lander in his journal:

About ten o'clock at night, when we were sleeping on our mats, we were suddenly awoken by a great cry of distress from innumerable voices, attended by a horrid clashing and clattering noise, which the hour of the night tended to make more terrific. Before we had time to recover from our surprise, our interpreter rushed breathless into our hut, and informed us with a trembling voice that 'the Sun was dragging the Moon across the heavens'. Wondering what could be the meaning of so strange and ridiculous a story, we ran out of the hut half dressed, and we discovered that the Moon was totally eclipsed. A number of people were gathered together in our yard, in dreadful apprehension that the world was at an end, and that this was but the 'beginning of sorrows'. We learnt from them that the Mohammedan priests residing in the city, having personified the Sun and Moon, had told the king and the people that the eclipse was occasioned through the obstinacy and disobedience of the latter luminary. They said that for a long time previously the Moon had been displeased with the path she had been compelled to take through the heavens, because it was filled with thorns and briars, and obstructed with a thousand other difficulties; and therefore that, having watched for a favourable opportunity, she had this evening deserted her usual track, and entered into that of the Sun. She had not, however, travelled far up the sky, on the forbidden road, before the circumstance was discovered by the Sun, who immediately hastened to her in his anger, and punished her dereliction by clothing her in darkness, forcing her back to her own territories, and forbidding her to shed her light upon the earth. This story, whimsical as it may seem, was received with implicit confidence in its truth by the king and queen, and most of the people of Boussa; and the cause of the noises which we had heard, and which were still continuing with renewed vehemence, was explained to us by the fact that they were all 'assembled together in the hope of being able to frighten away the Sun to his proper sphere, and leave the moon to enlighten the world as at other times'. The king observed that neither himself nor the oldest of his subjects recollected seeing but one eclipse of the Moon besides the one he was gazing at.

The Lander brothers arrived back in England in 1831, but despite their great achievement they initially received only rather grudging recognition. Eventually their exploits became more widely known; they were invited to Windsor Castle to meet

King William IV, and Richard was awarded the first Gold Medal of the newly formed Royal Geographical Society. John received the medal on behalf of Richard, who was once more travelling on the Niger, where unfortunately he was shot and died from his wounds.

Almost a century later a monument was erected at Jebba, south of Boussa. It was inscribed:

To Mungo Park and Richard Lander who traced
the Niger from near the source to the sea. Both
died in Africa for Africa.

Bibliography

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