

# THE ROLE OF MAPPING IN THE COLONISATION OF AFRICA: 1880-1914

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## Abstract

Before 1880 there had been few attempts at systematic mapping in Africa. Even settler colonies in southern Africa were poorly mapped by European standards. The mapping which had been produced elsewhere was generally at small scale using methods more familiar to navigators than to land surveyors. To try to overcome the lack of training in Britain initially the Royal Geographical Society (RGS) had started to publish *Hints to Travellers* which contained some instruction in surveying and, in 1879, the RGS decided to start its own courses in practical surveying.

Following the 'Scramble for Africa' the new political boundaries between European colonies needed to be mapped and a start made on providing the maps necessary to administer the new acquired territories. Drawing on reports to the Colonial Survey Committee and the minutes and correspondence files of the Royal Geographical Society, this paper discusses the debates around the types of maps needed for the new colonies and the most appropriate training to be given to the surveyors. It shows how the former surveyors of the Survey of India, led by Sir Thomas Hungerford Holdich, played a decisive role in British thinking.

## Introduction

Following the General Act of Berlin of 1885 which settled the European claims for colonial territories in West Africa and the Anglo-German agreement of 1890, which settled their rival claims in East Africa (Pakenham, 1991), Britain and the other colonial powers found themselves with large colonial territories which were barely explored, let alone mapped. Bartholomew (1890) in reviewing the state of world mapping, found that in Africa only 200,000 square miles (518,000 square kilometres) of the continent was covered by 'detail' survey, with approximately double that area covered by topographic maps. For the other 95% of the continent there were only route surveys (20%), 'general mapping, largely approximate' (41%) or no mapping at all (Bartholomew, 1890). With the exception of the 'settler colonies', such as Algeria or those, such as Egypt, where there was a history of central government, there were no survey organisations responsible for producing systematic mapping.

One of the first tasks facing the colonial masters was the surveying and demarking of the borders of the new territories. In the main, the British component of the boundary commissions was provided by the Royal Engineers (Watson, 1915). Royal Engineers were also used to carry out the early reconnaissance surveys of the new colonies and protectorates. However, it was clear that the new colonies would need to be able to provide for their own survey needs. If they were to develop and to generate enough revenue to meet the running cost of the colony, maps would be needed for administrative and cadastral purposes.

Different ministries concerned with the colonies had different priorities. The Treasury was concerned that the colonies should not be a financial burden and looked to the colonies to generate revenue from mining and export oriented agriculture. Both activities would require the establishment of a proper cadastre. The War Office was concerned for the security of the colonies from both internal and external threats. Their priority was the creation of accurate topographic maps. The Colonial Office, whose main concern was the efficient administration of the new colonies, required relatively simple administrative maps that showed the location of population centres and communications. The problem facing the colonial governors was a shortage of personnel and resources to create to required mapping. Given the shortage of skilled surveyors, who should do the surveying, what kinds of maps should be produced, and how should the mapping be carried out?

### **What kinds of surveys?**

How the mapping should be carried out was far from clear. Unlike in continental Europe and North America, the plane-table had not been used for detail surveys by the Ordnance Survey. As Close (1934) notes, the methodology used was that laid down by Colby early in the 19<sup>th</sup> Century. All detail was chained and hung on tertiary triangles with side lengths of about 2 km. Such a methodology was completely unsuitable for the kinds of surveys needed in Africa. Close, who had worked for the Survey of India on the mapping of north Burma went so far as to state 'In those days it was only the Survey of India that was capable of carrying out that class of work; a party of surveyors from the Ordnance Survey, or Chatham (the Royal Engineers' base), or trained at the RGS would have been absolutely at sea' (Close, 1932). He also noted that even the Survey of Western Palestine by Conder and Kitchener, a country ideally suited to plane-tabling, had been surveyed using prismatic compasses for the detail. The problem was, according to Close (1932) that training in Britain was 'out of touch with our greatest school of practical topography, the Survey of India'.

Others, however, took another view, rejecting the 'Indian model' in favour of a continuation of existing practices for surveys in largely unexplored country. These practices had grown up through the middle of the Nineteenth Century, during the first phase of European penetration of the African interior.

During that period what was needed for those going on expeditions were techniques that would allow the explorer to fix his position on the surface of the Earth when there were no surface markers to act as guides. To fix his position in, for example, the deserts or plains of Africa, the explorer needed to carry out observations which were, essentially, the same as those carried out by a navigator on the deck of a ship at sea. There were, however, some differences. To start with, the navigator at sea used the altitude of the sun or stars (the angle of elevation of the celestial body (measured relative to the horizon) to determine his latitude and longitude. The instrument used by a navigator to determine the altitude of celestial bodies was the sextant. An explorer on land had no reliable horizon and must, if he intended to use the same method, employ an artificial horizon, the horizontal surface produced by a dish of mercury.

In addition, a navigator would use a chronometer to carry the time with him at a known point on the Earth's surface. It was this, when coupled with the observations of the sun or stars, that enabled the navigator to fix his position. A chronometer was a fairly delicate piece of equipment and needed to be treated with some care. On a ship this did not pose any significant problems, but on an expedition where baggage was being carried on pack animals or porters, it was very easy for instruments to become damaged.

While these navigational techniques were adequate for fixing the position of the explorer or surveyor on the Earth's surface, to within a few kilometres, the techniques were

not suitable for creating maps of the surroundings. To do this, the explorer would typically combine compass measurements of directions with estimates of distance to create a sketch map. The explorer would thus produce a sketch map made up from observations made at few points along the line of march of the expedition. The techniques were simply not suitable for mapping extensive areas of land during the period of European colonisation.

Unfortunately, the chief advocate of navigational techniques, Sir Clements Markham, sometime Secretary and President of the Royal Geographical Society (RGS), was in a strong position to influence the techniques that were taught to colonial officials and, hence, used in the new colonial territories.

Before the late Nineteenth Century any potential explorer learnt surveying and navigation on an ad hoc basis. For example, Mill (1930) noted that when David Livingstone wanted to fix his position in the heart of Africa, he had to rely on the instructions received from the captain or mate of the ship that carried him there. The Map Curator in the RGS also provided some training in his spare time. Clearly, this was not a satisfactory arrangement so, in 1879, Markham made a proposal to the Council of the RGS "That it is desirable that the council should organise a plan for the instruction of geographical students and others about to visit unknown or little known countries, so as to train them as scientific observers: and that a Committee be appointed to consider and report upon the details of such a plan (cited in Markham, 1882). The Scientific Purposes Committee was charged with carrying out the study and, having considered the current situation, resolved that the scientific lectures should not be continued but that a provisional scheme for the training and instruction of travellers be drawn up by the Assistant Secretary, Markham (minutes of the Scientific Purposes Committee, 16 June 1879). Later the same month, the Committee minutes record that the training was limited to surveying and mapping including position fixing by astronomical observations and barometric and hypsometric observations. Only three were taken on to the first course. Mr Coles was to report monthly to the Assistant Secretary the names of intending travellers who had received instruction on each day, the instruction given and the students' progress (minutes of the Scientific Purposes Committee, 27 June 1879).

Clearly the experiment in instruction was regarded as a success as in November, and following a report read by Coles, the Committee decided that instruction arrangements should continue (minutes of the Scientific Purposes Committee, 28 November 1879).

It seems that from the outset, that having taken the course in surveying was also being regarded as a criterion for being allowed to borrow RGS equipment. Thus in early 1880, when Captain Phipson-Wybrauts wanted to borrow equipment, Coles' note that Phipson-Wybrauts is capable of using the equipment is used in deciding to grant permission (minutes of the Library and Map Committee, 17 March 1880). On the other hand, when the Reverend D. McKenzie requested the loan of instruments for use in Zululand, Coles' report was sufficient to reject the application (minutes of the Scientific Purposes Committee, 12 November 1880).

At the same meeting that rejected the application from McKenzie, the Committee received a general report from Coles and resolved to consider the whole question of instruction with a view to recommending final arrangements to the Council (minutes of the Scientific Purposes Committee, 12 November 1880).

In January of 1881 the Scientific Purposes Committee considered Coles' report on the training given. It considered the report highly satisfactory and recommended that Coles be confirmed in his appointment with the designation 'Instructor in Practical Astronomy and Surveying to the Royal Geographical Society'.

There was clearly still some disquiet over the amount of training available nationally as, in 1882, Markham again brought the issue before the Council in his paper entitled 'On the instruction at present supplied in this country, in practical surveying, astronomy, navigation,

route surveying, and mapping'. In this paper, Markham notes that, although the training being given by the RGS was successful (532 lessons to 42 students from 1879 to the end of 1881), the course could only meet a 'small fraction' of the need for instruction by 'those whose occupations take them to distant and little known regions, and who, if they had the needful training, might do good service to geography' (Markham, 1882).

To determine what the true state of training provision was in the country, Markham collected together all the information he could on the existing training establishments and the courses on offer. Some 38 institutions are listed together with information on the backgrounds of the institutions and, in some cases, the instructors. The important thing to note from Markham's report, however, is that all the institutions listed are primarily schools of navigation for potential officers in the Royal or Merchant Navies. None of the institutions was delivering a syllabus that would have been recognised as suitable for a land surveyor.

It is clear from this that Markham's idea of what constituted surveying was position fixing using essentially the same maritime techniques that he had used in his youth while in the Royal Navy. The appointment of Coles to the post of instructor also makes sense in this context since, as Reeves (1933) notes Markham 'was especially attached to Mr Coles, doubtless because both of them in their young days had served in the Royal Navy.' Coles' predecessor as Map Curator had, of course, also been a Navy officer.

By 1891 there was some disquiet amongst the Army officers on the Council about the nature of the training being given in the RGS. This disquiet seems to have originated within the surveyors who had served in India, and probably reflected the concerns of serving officers still in India. The most obvious expression of this disquiet was the paper read by Holdich to the Geographical Section British association, Cardiff in August 1891 (Holdich, 1891).

To meet changing needs for the kinds of maps that needed to be produced, the courses taught within the RGS needed to change. In part, this was because the RGS was moving away from giving instruction to explorers, towards providing training courses for the new class of colonial administrators generated by the fruits of the 'Scramble for Africa'. The Colonial Office requiring its officials to take an elementary course in surveying before taking up appointments in Africa and elsewhere (Reeves, 1933).

However, it was not just the ways in which survey data was collected that was coming under scrutiny within the RGS. In 1892 Col. Dalton of the Intelligence Department, and Council member, submitted a memorandum to the Council calling for a more systematic approach to the presentation of maps within the publications of the RGS. He was particularly concerned about the use of sources noting that 'these maps, which are doubtless carefully compiled, often fail, I would submit, to carry the weight which they ought to carry with those whose duty it is to compile maps, because they do not, as a general rule, bear upon the face of them, nor are they usually accompanied by, a sufficiently full explanation of the authority for the map, and of the sources from which the compiler has taken his details; also, his reasons for either accepting or rejecting certain positions.' He goes on to state that Petermann's 'Mitteilungen' adopted a much more sound approach in its use of sources (Dalton, 1892). As someone concerned with military mapping within the Intelligence Department, it is clear that Dalton had his own agenda. But, it is one more example of the pressure coming to bear on the RGS to adopt a more rigorous approach to data collection and publication.

There was also pressure for some kind of formal recognition for students who had completed the survey training course. The Education Committee considered the matter in 1896 and proposed that Diplomas should be awarded to students who took the Society's course of instruction. The Diploma should be granted based on a definite programme of instruction under Coles and only when a committee appointed by the Council was satisfied with the pupil's efficiency (Minutes of Education Committee, 9 December 1896).

Following the Education Committee meeting, Markham wrote to the Council

recommending the award of Diplomas to those who completed all of Coles' course and that the Diplomas should be signed by the President and the Secretaries. He thought that the Diploma would increase the desirability of the course and that the adoption of this measure would be welcomed by the War Office and other government departments and public bodies (Markham, 1896).

Markham noted that there had thus far been 25 students who had passed through the course since it had started but that the majority had learnt either the sextant or the transit theodolite and the prismatic compass or plane table, and the computations for latitude and time. However, he thought that the Diploma should only be awarded for the complete course (Markham, 1896). Although the syllabus outlined by Markham still contained some elements of navigation rather than surveying, it was clearly moving in the direction advocated by Holdich (1891). Also accompanying Markham's letter is a report from Coles in which he lists the 25 who had taken the course. Ten of the 25 were soldiers, of whom 4 were Royal Engineers. Others were from the Colonial Service and the Chinese Consular Service. The second largest number (seven) were, however, men with C.E. after their names, of whom three are shown as being dead. In the absence of any other information, it can only be assumed that these were either missionaries or civil engineers

At the Council meeting on 22 March 1897, letters were received from the War Office and the colonial Office acknowledging receipt of the Secretary's letter intimating that the Council was to institute the Diploma for competency in surveying. The letters requested further information concerning the programme of instruction proposed (Council Minutes, 22 March 1897). It seems clear that neither the War Office nor the Colonial Office was prepared to accept a Diploma from the RGS without knowing precisely what was being taught on the course. As the War Office and Colonial Office were likely to be the largest sources of pupils, they would have been in a strong position to influence the programme.

By the time the 8<sup>th</sup> Edition of *Hints for Travellers* appeared in 1901, things had moved on considerably with a large section given over to techniques suitable for mapping extensive areas of territory. Behind these changes had been a number of developments in the RGS. In 1900 Coles had retired and the RGS needed to appoint a new instructor. In the interim, Reeves acted as instructor, having already been appointed Map Curator in place of Coles. A number of people were considered for the post of Instructor with the Expedition Committee taking advice from Close and Holdich. The men considered were all from overseas survey departments, either Indian or Siamese, with McCarthy of the Siamese Survey being appointed in November of 1900. However, he resigned after a few months and Reeves was confirmed in the post. This may have been the last 'triumph' of Markham in the survey field. As a protege of Coles and Markham, Reeves would have been seen as carrying on in the naval survey tradition whereas McCarthy would have undoubtedly wanted a syllabus in line with the kinds of work that he had been doing in Siam (broadly similar to the work in India).

In May of 1900, following Coles' retirement, there had been discussions within the Expedition Committee of the need for two types of survey qualification from the Society, a 'Certificate' that certified competence in the use of specified equipment and a 'Diploma' in recognition 'of more advanced qualifications, such as would justify the Society in recommending the holder for the actual charge of survey operations on an extended scale in the field' (RGS Expedition Committee Report, 1900). Appended to the Report were a list of amendments to the to the Diploma course suggested by Holdich and submitted by Thuillier (former Surveyor General of India) in May 1899. The list is worth reproducing in full:

1. Methods of rapid base measurement suitable for the extension of theodolite triangulation.

1. The use of the theodolite for determining  
Latitude,  
Time,  
Azimuth,  
Longitude (moon culminating stars),  
as well as all ordinary triangulation, including heights.
1. The proper use of angle books and the keeping of records, as well as all the computations connected with the above (i.e. ♠<sup>n</sup>, latitudes and longitudes, height, and astronomical computations).
1. The theory (if not the practice) of determining longitude by Telegraph.
1. The use of the mercurial barometer for determining initial heights.
1. The projection of plane-table sheets for geographical purposes(i.e. graticuling, and the projection and checking of trigonometrical points). Scales.
1. The use of the plane-table for topography, including determination of compass error, the use of the clinometer, etc

He goes on 'I should be inclined to discourage the use of the sextant and advocate that of the smaller class of theodolites. I would also discourage the use of aneroids and advocate the clinometer and triangulated heights, using the aneroid only within small limits of altitude. ....Means for giving practical instruction in geographical plane-tabling must be considered. Plane-tabling Mitcham Common is hardly sufficient' (Holdich, 1899). The latter is a reference to the use of Mitcham Common for much of the practical training in surveying (Reeves, 1933).

The amendments suggested by Holdich were clearly intended to produce a surveyor trained along the lines then current in the Survey of India. The rejection of the sextant was part of the attempt to move away from reconnaissance surveying and towards the systematic acquisition of geographical data. Such a suggestion was bound to bring a sharp response from Markham.

The response came in a hand-written note to the Council. In the note Markham draws the attention of the Council to the consequences of the adoption of the Expedition Committee's Report which will be 'the gradual abolition of our present system of instruction, and the substitution of something quite different, with different methods and a different object' (Markham, 1900). He states that 'we prepared travellers for first exploring work.' (emphasis in the original). He goes on 'it is not improvement that is proposed, but a new object altogether, to be attained by new methods: a substitution of teaching surveyors to conduct rigorously accurate surveys, for teaching travellers to explore.' There is more along the same lines in the note and it ends with the plea 'retain the present admirable and most successful system at least for the present. It is only three years since the Council fully sanctioned it. It has succeeded. Why destroy it. (sic)' What Markham seems not to have noticed was that the world had moved on. As Reeves (1933) noted 'As time went on and there were fewer blank spaces on the maps to be filled in, it became apparent that the days of the rough exploratory surveys were drawing to a close, and more accurate survey work would be required'. Markham's days as the decisive voice in the direction of survey training were clearly numbered and, after 1900 'the character of the instruction was assimilated generally to the methods of the Survey of India and the School of Military Engineering' (Mill, 1930). In the end, the influence of the Army officers in the Council was to be decisive and Naval methods were abandoned.

The introduction of western technology into the new colonies would, in any case, have removed the need to teach a number of the techniques advocated by Markham as they

rapidly became obsolete. For example, Close (1899) makes reference to the use of the telegraphic determination of the longitude of Blantyre. The rapid extension of the telegraph network across the colonies meant that time signals could be transmitted effectively removing the requirement to determine longitude by 'moon culminating stars', 'occultations of stars by the moon' or 'eclipses of Jupiter's satellites'. Holdich's recommendation that telegraphic methods should be taught was simple acknowledging the impact of technological change.

The 9<sup>th</sup> Edition of *Hints for Travellers* (1906) went still further along the way towards being a convention text in land surveying and mirrored the changes in the RGS courses. In 1910 the course received official recognition from the Colonial Office as the training for young officials in surveying and mapping. Reeves (1933) records that, between 1902 and his retirement in 1932, he had trained some 1700 students, of whom 890 were sent by the Colonial Office for training. In addition to raising the prestige of the RGS, the courses had also become an important additional source of revenue, receiving 2 shillings and six pence per hour for each student trained.

Even while the former Indian surveyors were achieving a victory for their techniques within the RGS, the techniques which were destined to replace the plane table and clinometer were already on the horizon. In the mid 1890s the use of photo-theodolites was already being demonstrated to be a viable approach to mapping in mountainous areas (for example, Scheimpflug, 1898) and in Canada Deville (1895) had shown that photography could be used to map the vast northern expanses of that country. In 1908 Vivian Thompson presented his 'Stereo-plotter' at a meeting of the RGS to considerable scepticism from the British surveying community (Thompson, 1908). Once again, it was to India that was to take the lead, using Thompson's stereo-plotter for extensive surveys in the Himalaya and, after the First World War, pioneering the civil use of aerial photography in the Irrawaddy Delta (Lewis, 1925). Although the Ordnance Survey was to experiment with the use of aerial photography during the 1920s and 1930s, it was not until after the Second World War that it started to make systematic use of air survey techniques (Seymour, 1980). The same was largely true the African survey departments which made little or no use of aerial photography for mapping until after the Second World War.

## **Conclusion**

It is difficult to over emphasise how important the training provided by the RGS and the *Hints for Travellers* were. Even as the Army sought to provide its own proper training courses and textbook, reference was still made back to the methods developed and taught at the RGS and to the descriptions of techniques given in *Hints for Travellers*. In the *Text Book of Topographical and Geographical Surveying* by Close (1905), frequent references are made to, and whole sections reproduced from, *Hints for Travellers*. However, in the Preface Close (1905) notes that "the field methods use are, for the most part, those used by the Survey of India". What we see, therefore, are the methods of the Survey of India being introduced into survey practice in Britain through the training programmes and publications of the RGS. That this happened was due to the gradual increase in the influence of the Army, particularly the Indian Army, in the RGS. With the shift in emphasis from survey for exploration to survey for settlement, exploitation and government we see a move towards the systematic collection of geographical data which parallels the shift towards more systematic geography within the British geographical community.

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