The Triangulation of Africa

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machinery worked under his presidency; but when it was necessary, he displayed unbending firmness.

"His great pleasure was to show kindness and consideration for young men whose work came before him, and to inspire them with confidence. He was quick in distinguishing real merit from charlatanry, however cleverly veiled; and the former always secured the greatest and most patient attention at his hands. There was nothing which struck those with whom he acted so much as the total absence of any personal motive, however slight, in all he did or said.

"As to his own individual share in any measure or undertaking, he was absolutely indifferent. In this he always seemed to be the purest type of a public servant. To him the general good was everything, his own share in producing it absolutely nothing. Thus it was that there was many a suggestion made by him, many even matured plans which bore valuable fruit owing to his initiative, with which his name will never be connected in the remotest way. As a geographer his knowledge was not only sound, but, in many branches of the subject, and these far from being all connected with India, it was minute and detailed. He often displayed such detailed knowledge quite unexpectedly and on most unexpected points, so that where we only anticipated in him a general adviser we often found an expert."

This is no mere eulogy or conventional tribute of respect to the memory of a more than average good man. It is an estimate of character which can be certified in the memories, or illustrated in the note-books of those who have enjoyed the privilege of Sir Bartle Frere's acquaintance and friendship. Illustrations indeed—such as here referred to—would abound, although unlikely to find a place in set biography, as bearing upon comparatively obscure episodes. Of the many which readily occur to the mind of the present writer, two might be cited to exemplify his unobtrusive, and therefore unrecorded usefulness. They refer to the active part he undertook, at one time, in securing an acknowledged western frontier to Baluchistan; at another, in promoting telegraphic communication between England and India. Both questions were of high significance, and in both the object involved was attained. But the importance of results gives no guarantee that the story of beginnings will not fade into oblivion.

THE TRIANGULATION OF AFRICA.

By General E. F. CHAPMAN, C.B.

THE following letter, on the desirability of international co-operation for the purpose of obtaining the materials for an accurate map of Africa, has been sent to Mr. Clements R. Markham, C.B., President of the Royal Geographical Society, by General E. F. Chapman, C.B., Director of the Intelligence Division, War Office:—

I am anxious to bring before you a subject, connected with geography, which has been engaging my attention for some time past.

It appears to me that, great as has been the development of political and commercial interests in Africa during the past decade, our knowledge of the topography of the interior of the country has not made an advance by any means as important, and that there are large portions of that continent of which no accurate maps exist, although they have been for years under a civilized administration and occupied by settlers of European descent.

I, therefore, venture to suggest to you that the occasion of the meeting of the International Geographical Congress in London this year offers an invaluable opportunity for considering how a reasonably accurate and complete map of Africa can be built up, and for urging upon the different governments and geographical societies the advantages of united action.

Would it not be possible to ask the Congress to point out to the civilized States of Africa, the great importance, from an economic as well as from a scientific point of view, of carrying out geodetic surveys, wherever it is practicable to do so?

In South Africa, geodetic triangulation of a high class has been carried out in the Cape Colony and Natal; but it has not been connected trigonometrically with the Bechuanaland triangulation, although it almost touches it.

To turn this triangulation to practical account, it is, of course, necessary to extend secondary and tertiary triangulation from it over all the settled lands, in order to provide fixed points to which to tie the detail, and to which the boundaries of the numerous farms can be referred. Unfortunately, this has been but partially done in the Cape Colony and Natal, and it is only in British Bechuanaland that we see a definite scheme being consistently carried through.

In Lower Egypt triangulation for revenue purposes is being executed by the officers of the Irrigation Department, but its advantages have unfortunately been minimized by the difficulty of finding sufficient money to meet the expense of providing permanent marks.

In Algeria, on the other hand, the French have been more alive to the necessity of having a regular survey, as is shown by their excellent maps of that country. This survey is now being rapidly extended over the adjacent Protectorate of Tunis.

Italy, too, has seen the advantage of pushing on triangulated surveys, and has turned out minutely detailed maps of the country adjoining Massawa.

Where Europeans settle in Africa regular surveys must, sooner or later, become indispensable, and by commencing them as soon as a country is occupied, a great eventual saving is effected, as is well shown in the report of the Surveyor-General, British Bechuanaland, for the year 1890-91, from which I take the following extract:—

“From a practical point of view, the value of this work can hardly be over-rated; in many countries erroneous surveys are one of the most fruitful sources of litigation and waste of money in connection with disputed land-boundaries, necessitating very often the enormous expense of subsequent geodetic triangulations and re-surveys of land grants. The Imperial Government has conferred a great boon on this territory by authorizing a geodetic triangulation as the basis of all future survey operations; . . . we are indebted for the great practical advantages we are already reaping from this work, viz. the correct and uniform data supplied to our surveyors, which enables them to do their work in a satisfactory manner, and the great facility and accuracy with which, in this office, we are enabled to lay down on the map of the country the results of every survey which has been connected with the trigonometrical piles.”

I think it will be admitted that the completion of the geodetic survey of the

South African peninsula is a work which is urgently needed, and that it is to be regretted that the Orange Free State and the South African Republic have hitherto neglected this very necessary part of the duty of a civilized State.

The British South Africa Company, which is now laying out its territories for occupation and development, has an excellent opportunity for taking the lead in this matter, by starting a geodetic survey of its occupied areas in Matabililand and Mashonaland, which should eventually be pushed across the Zambezi into the country north of that river.

In the Nyasa Protectorate, as much labour has been expended in sketching routes and taking astronomical observations as would probably have sufficed, under proper direction, to produce a trigonometrical survey of the greater portion. Such a survey must eventually be made, and I think there can be little doubt that the truest economy would be to start it at once.

Still, it must be admitted that there are large portions of the continent of which fairly accurate maps are eminently desirable, but which are likely for many years to remain untouched by regular surveys. The requisite topographical information regarding these areas might in time, where the country is of a suitable nature, be obtained with comparatively little expense by the system of plane-tableing, based upon rapid triangulation, that was carried out by our officers in Afghanistan, and has since been extended with so much success, under the direction of Colonel Holdich, C.B., R.E., over Baluchistan.

A certain amount of this class of work has already been executed by English officers in various regions, viz. in Somaliland, on the Anglo-German boundary in East Africa, at Wadi Halfa, at Suakin, and on the Anglo-Portuguese boundary in South-East Africa.

It is, of course, impossible to dictate to independent travellers the line that they are to take, or the class of survey that they are to adopt; but it seems to me that the Royal Geographical Society might do much to influence intending travellers, especially those whose professed aim it is to aid the cause of geography, if it could induce other societies to join with it in impressing upon the travelling world that the requirements of the present day are fairly complete surveys of areas, rather than mere routes. Route traverses, whether supported or not by a few astronomical observations, are in many parts out of date. There are some areas scored all over by the tracks of explorers, of which we are still unable to put on paper anything like a sufficiently good general map on a fairly large scale. Should the geographical societies think fit to give it to be understood that the right way to aid geographical science is to make a fairly complete survey of a district rather than to add one more long thin line across from sea to sea, I am confident that we should advance much more rapidly than at present towards a complete knowledge of the Dark Continent.

In order, however, to utilize to the full any such surveys as may be made, it is necessary that we should be able to locate them with accuracy. To do this we must have in their immediate vicinity points so accurately fixed that their values are above criticism. Where we still have to depend upon route traverses, such points are even more necessary. Triangulation, even of the most rapid class, moves comparatively slowly, and it appears certain that for years to come geographers will have to depend largely on other methods. I wish, therefore, to raise the question as to whether anything can be done in a comprehensive manner to provide the framework of accurately fixed points that is so much needed.

It seems to me that much might be done by a system of co-operation and exchange between the different governments and the various geographical societies of Europe, and I would venture to suggest that by their united action it might be

possible to arrive at a list of all the well-fixed places in non-surveyed portions of Africa, and to inaugurate concerted measures for establishing the positions of the other places of sufficient importance.

Geography, at present, suffers not from a want of observers, but rather from an excess of observations of a kind that cannot be trusted, which only increase the compiler's difficulties instead of removing them. No doubt almost every observation that is taken throws some light, confirmatory or otherwise, on those taken by previous travellers. Where, however, as often happens, there is a discrepancy between the new and the old results, it is of the utmost importance that we should obtain full information as to the trustworthiness of the new observations. In this matter the Germans have set an excellent example to other nations; and if their practice were more generally followed, there would be far more certainty of all observations being taken at their proper value. At the same time, it is eminently desirable to get observations of a better class than was formerly possible. If the various governments or societies could arrange to send competent observers to the countries in which they are interested, how many important places might be fixed in longitude by means of the telegraph lines that are now spreading over the continent in all directions! The points thus determined would go far towards providing the framework that is so much wanted.

In Asia, also, there is one matter which might well be brought to the notice of the Congress. I allude to the question of joining the great trigonometrical survey of India with the Russian triangulation. The Congress could, no doubt, express an authoritative opinion as to the value, from a scientific point of view, of the results to be obtained from the completion of this work, an opinion which would do much to influence the governments concerned to consider whether they could provide the funds necessary to carry it out.

To sum up, my suggestions are that the Congress should be invited to consider and bring to the notice of the various governments concerned and to the geographical societies of the world, the following subjects:—

- (1) The advantages to be gained from an economic, as well as from a scientific point of view, of extending geodetic surveys in the settled portions of Africa.
 - (2) The importance, in districts beyond the probable range of geodetic surveys for the next few years, of making surveys of areas rather than of routes; and the advisability of basing such surveys on rapid theodolite triangulations, wherever it is practicable to do so.
 - (3) The desirability of collecting a complete record, as regards Africa, of all the positions that have been accurately fixed astronomically in areas that have not been triangulated, and of combining measures for the purpose of determining new positions, taking care that, in the case of all future observations, full data should be published so as to enable the geographical world to appraise them at their proper value.
 - (4) The advantages to geodetical science of trigonometrically connecting the triangulation of India with that of Europe by joining it on to the Russian triangulation of Trans-Caucasia.
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