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The Indian Survey Report for 1895-96

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I have alluded to the work of the Fish Commission in studying the character, habits, and migrations of marine life, and by its side should be mentioned the similar work on land carried on by the Biological Survey in the Department of Agriculture.

Of the great advances in geographical knowledge resulting from the exploration of Lewis and Clarke, near the beginning of the century, from the work of Fremont, the pathfinder, from the Pacific railroad surveys of fifty years ago, and from numerous military expeditions, time fails me for more than a bare mention.

Thus I have passed in rapid review the greater geographical agencies of the United States. Some of these will be presented to you more at large by the gentlemen actually conducting the works outlined. As to the future, it will easily appear that the amount already achieved is but a small part of what remains to be done. Geographical research and progress in the United States has never been more active or swifter than it is to-day, and knowledge of environment and resources is gathered in large instalments each year. To discover and develop its resources, the United States is now employing about five thousand persons, and expending nearly \$8,000,000 annually. Just as the Royal Geographical Society of London sixty-seven years ago began its work of fostering and promoting geographical research, so the National Geographical Society of Washington nine years ago entered upon similar work. Great and lasting good has resulted from each undertaking. May their efforts continue until dark continents and unexplored regions shall have vanished from our maps!

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## THE INDIAN SURVEY REPORT FOR 1895-96.

THE Indian Survey Report, which usually arrives in England in April or May, has been considerably delayed this year, and has only recently come to hand. This appears to be due to the fact that the operations reviewed therein extend up to September 30, 1896, instead of March 31, 1896, as would have been the case had the old practice been adhered to of assimilating the survey year to the financial year. We are not told the reason of the change, but it may be assumed that it fits in more conveniently with the plan of operations and rotation of work in the field, which naturally opens with the commencement of the cold season, and which thus forms a better starting-point for an annual review of work. Colonel C. Strahan, R.E., was surveyor-general during the year, assisted by Colonels W. H. Wilkins and J. E. Sandeman, in charge of the Revenue and Bengal Survey branches, and Lieut.-Colonel St. G. C. Gore, R.E., in superintendence of the Trigonometrical Surveys. Principal triangulation was executed during the year, both in Upper Burmah and in Baluchistan. In the former, the series which will connect the Mandalay Meridional series with the Assam triangulation was carried across the flat forest-clad valley of Chindwin, but, owing to the haze and the difficult nature of the country, it was found impracticable to complete the connection. In Baluchistan a beginning was made with the principal longitudinal series, which, starting from the Great Indus series of the main triangulation of India, is to be pushed westwards through Baluchistan and Makran, and will thus form an accurate basis for the mass of secondary triangles and detailed reconnaissances which have from time to time been carried out in the regions immediately west of India. This fabric of triangulation will undoubtedly be extended in process of time, so as to link up the trigonometrical systems of Europe and Asia. During 1895-96 three figures,

extending over 1114 square miles, were projected westward into the territory of Las Bela, the chief of which died in January, 1896.

With regard to topography, six survey parties were engaged in the Southern Maratha country, in Sind, Baluchistan, in the Himalayas, and in Upper Burma (2) respectively. The first-named of these surveys has now been brought to a completion, after nine seasons' work, and the party have consequently been transferred to Burma. The Baluch party was divided up into five detachments, one of which, under Mr. Tate, was engaged on the Baluch-Afghan Boundary Commission, and the record of this piece of work forms the most interesting chapter in the present Report.

The scope of the Commission included the delimitation of the frontier between British territory and Afghanistan from the southern limit of Waziristan up to the eastern confines of the Persian Empire. Of the large extent of country lying between these widely distant extremes, the common boundary had been settled only as far south as the British frontier outpost of Chaman, where the operations were brought to a close in June, 1895. The winter of 1895-96 was devoted to the demarcation of the boundary between this point and the Persian frontier, where the Koh-i-Malik Siah had years ago been recognized as the tri-junction point common to the frontiers of Persia, Afghanistan, and Baluchistan. Its position, however, had never been determined with exactitude, and to settle this was a principal part of the programme of the Commission.

The formal meeting of the two commissioners, Sardar Muhammad Umar Khan on the part of the Amir, and Captain McMahon for the Government of India, took place on February 3, 1896, at the Wachdara, after which the work of delimitation was commenced. For the first 60 miles of its course the boundary followed the crest of the western scarp of the Peshin plateau in a generally southern direction. From the highest point of the plateau it struck westward, leaving the Chagai fort which had been seized by the Afghans about ten or twelve years ago, within Baluch territory. The formal surrender of the fort itself was made on the return journey, while the mission was encamped in its vicinity. So far the country traversed was covered by the Kharan triangulation of Mr. Tate in 1886-87, and that carried out in 1884-85 by the Afghan Boundary Commission. The fresh work began after the 64th meridian of longitude was passed. Between that and the meridian of  $62^{\circ} 30'$  the country consists of lofty hills, rising sheer out of the plain, and composed for the most part of granite and igneous rocks. With two exceptions, their summits were inaccessible. The most conspicuous and impressive is the Malik Dokand hill, near which alabaster is found in abundance. All around lies a sea of sandhills, while further to the west, between Malik Naro and Koh-i-Sultan, is a small hollow tract where good water is obtainable near the surface, and the great natural spring of Manzil is found. The natives have a tradition that this was once a Hamun, which has since become filled with drift-sand. Mr. Tate thinks it may possibly have been a portion of the great hollow or depression of Zirreh, or Zarang, by which name the country was known to the Arabs, and which had existed even in Arrian's time, as the name of Drangianæ appears to indicate.

The Koh-i-Sultan is a group of hills some of whose peaks rise to a considerable height, the loftiest being 7656 feet. These hills are rich in minerals, sulphur being especially abundant, while the assafetida plant grows very plentifully on the otherwise bare and arid slopes around. The assafetida is sought after, not only by the inhabitants of the surrounding country, but by the Afghans of Zhob and far distant Ghazai. The latter form large caravans and visit the Koh-i-Sultan every year, usually staying some months to gather the plant.

Between  $64^{\circ}$  and  $62^{\circ} 30'$  the existing maps were found to be very unreliable,

and a careful re-survey was made, the detailed work being carried across the boundary-line to Afghan territory, up to the southern edge of the desert skirting the Helmand river. Further west, between  $62^{\circ} 30'$  and  $61^{\circ}$ , very little trustworthy topography had been laid down by previous travellers, but, unfortunately, the country here was so inhospitable, that it had to be traversed as quickly as possible.

From the summit of the Koh-i-Malik Shah, angles were taken to all the prominent peaks that were visible, observations being obtained to the southern and apparently the higher of the twin peaks of the Koh-i-Taftan, the topmost point in the mountains of Eastern Persia. It rises to an elevation of 12,000 feet, and quite at the end of April there was still a great quantity of snow apparent on both its summits. On the top of the Koh-i-Malik Shah, a mark-stone and a cairn 10 feet in height were raised, and in the Report under review we are presented with a remarkably clear and life-like photograph of the English officers, viz. Captain McMahon, Surgeon-Captain Maynard, and Mr. Tate, together with the Afghan Commissioner and the Governor of Chaharbuijak in the Helmand. At Koh-i-Malik Shah the mission broke up, the British Commissioner and party returning by the same road as they had come.

Altogether 12,000 square miles of triangulation and 19,200 square miles of topography were completed by the detachment, the latter being for the most part a revision of old reconnaissances.

Sub-Surveyor Jamaludden mapped about 14,000 square miles on the  $\frac{1}{4}$ -inch scale near the Persian border, but unfortunately the report gives no idea where this work was actually accomplished, although we are told that it was in connection with a request for the sub-surveyor's services made by Captain Sykes, British Consul at Kirman.

In Upper Burma the topographical work consisted of the commencement of the 1-inch topographical survey of the Northern Shan States, geographical survey on the  $\frac{1}{4}$ -inch scale in the Myitkwa district, and the continuation of the demarcation of the Burma-Siam boundary. It is satisfactory to learn, after all one has heard of the expense of surveys in Burma, that transport animals are becoming yearly less expensive to hire, and railway communications are gradually becoming more available, so that the cost-rates bid fair to decrease. The Burmans, too, are showing themselves yearly more sensible and amenable to discipline, and before long, no doubt, will take service as surveyors in local topographical parties; the work being peculiarly suited to them, as they are very intelligent, quick to learn, and deft with their fingers, while the higher pay which they require is compensated for by their knowledge of the language and country, and in various other ways.

The out-turn of forest surveys during the year amounted to 4914 square miles, and of cadastral surveys, 8609 square miles. Three parties were employed on traverse surveys, the object being to furnish a skeleton basis for settlement surveys by local agency.

The operations for the telegraphic determination of the difference in longitude between Karachi and Greenwich have been already briefly touched upon in the *Geographical Journal*. Captains Burrard and Lenox-Conyngham continued the work that they had begun, and the arcs Potsdam—Teheran and Teheran—Bushire were measured. In spite of the immense length of the line to be worked and the unpropitious nature of the weather experienced, the work was completed most satisfactorily, and the subsequent reductions have been finished. The final value of the longitude of Madras is  $5^{\circ} 10^{\text{m}} 59.113^{\text{s}}$ , a value which is  $0.308''$  less than that which has been hitherto regarded as the most accurate available. It is equivalent to  $4.62''$  of arc, or about 150 yards in linear measurement.

