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TRIANGULATION OF SOUTH AFRICA.

Geodetic Survey of South Africa. Vol. ii. Report on a Rediscussion of Bailey's and Fourcade's Surveys and their Reduction to the System of the Geodetic Survey. By Sir David Gill, K.C.B., LL.D., F.R.S., &c., H.M. Astronomer at the Cape. Pp. xx + 257. (Cape Town, 1901.)

THE Geodetic Survey of Cape Colony and Natal was carried out in the years 1883-92 by Colonel Morris, C.B., C.M.G., R.E., under the direction of Sir David Gill, and the results were published in the report issued in 1896.

The present volume is entitled vol. ii. of the Geodetic Survey, although, as Sir David Gill points out, its contents are not strictly of a geodetic character. As, however, many of the points are connected with stations of the Geodetic Survey, "with all the accuracy required for astronomical geodetic stations, it has been considered convenient to preserve the results in the same series of publications."

This vol. ii., then, is a discussion of the secondary triangulation carried out by Captain Bailey, R.E., in the years 1859-62, and of that executed by Mr. Fourcade, of the Forestry Department (in 1893?). These triangulations extend along the southern coast of South Africa from Cape Town to East London, a distance of about 550 miles, and have an average width of about 75 miles, covering an area of some 40,000 square miles. The probable error of an observed angle of Bailey's triangulation is about $\pm 2''\cdot 0$; of Fourcade's, $\pm 0''\cdot 85$. The number of points fixed is 133.

The history of the computation of Bailey's work is somewhat curious. In 1862 the Survey party embarked at Algoa Bay for England in a coasting steamer. The vessel struck upon the rocks off Struy's Point and became a total wreck. The original observation books were all lost. Fortunately, copies of abstracts of angles had been supplied to the Admiralty Surveyor, then at work on the Coast Survey, and other abstracts with a diagram had been sent to the Surveyor-General, to the Government of British Kaffraria, and to private individuals and surveyors, and from these a report was compiled by Captain Bailey and presented to the Cape Parliament in 1863. On the completion of the Geodetic Survey, however, it became obviously necessary to harmonise Bailey's work with the geodetic triangulation.

Throughout the length of the secondary work there are many sides which are common to it and the geodetic triangulation. The secondary triangulation has therefore been broken up into a number of small manageable figures. In these figures the number of equations of condition averages about ten, and in the reduction the geodetic triangulation is considered errorless, and its sides and angles enter as fixed quantities.

The net result is an important addition to the triangulation of South Africa. The volume is all the more valuable for the fact that the results of the Geodetic

Survey (the report of which is now out of print) have been reprinted in the present report, which contains the whole of the accurate trigonometrical data in the Cape Colony and Natal which had been completed up to the year 1901. It may be hoped that the day is not far distant when this work will be used as the basis of the much-needed, long-delayed topographical survey.

Sir David Gill ends his preface with a remark which several national surveys might take to heart with advantage:—

"It is also of supreme importance that regular inspection of the Survey beacons should be instituted, and steps taken to provide for their repair and maintenance . . . it is most necessary in the public interest that these invaluable land-marks, which have cost so much in labour, skill and care to establish, should in future be more carefully preserved."

It may be noted that this is a duty which in India has long been recognised and carried out by the Government.

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VITALITY.

Religio Medici, &c. By a Student of Science and Medicine. Pp. viii + 216. (London: Good and Co., 1902.)

THE reader of this book is at first sight beset by two prejudices; the title, as printed on the back of it, "*Religio Medici*," is one which a great writer has made his own, a writer whose weight and intensity stand in contrast with the diffuseness and repetition of the present author; and secondly, the type is so small and defective that the labour of perusal is out of all proportion, so the reviewer is apt to think, to the value of the contents. A distant imitation of Sir Thomas Browne's conciseness would have halved these contents, at least; and thus reduced the cost of production by means better than inferior print. At the hundredth page our eyes gave out; but, after a glance at the remainder, we think in the first moiety one may read the whole.

The main purpose of the author is, by an argument which is similar to that of Dr. Lionel Beale, if not identical with it, to assert that "vitality" or "life power" belongs to the spiritual as opposed to the physical or material category, the realm of life being separate from the realm of matter. The end or purpose of this argument is not, of course, to be flouted because it cuts at the root of modern conceptions from which such entities have been dismissed; nay, even if the author regards force as something acting upon matter, as a bellows upon sand, it does not become us to throw his book aside because we have outgrown or parted company with such opinions. Evidently the author is not only an earnest and high-minded thinker, but also an accomplished scientific observer. His skill in the use of the microscope and its methods is probably considerable. But, while our minds are open and our respect for the writer is great, before we occupy our space with so vast a discussion we must have reasonable expectation of getting close to the points of issue. Of this approximation we see little hope. In the first place, it is inconceivable that modern conceptions will ever be put on the shelf that older opinions may be taken up again in their former

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