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VII.—THE GEOLOGY OF THE HENNOPS RIVER VALLEY, SOUTH-EAST OF IRENE.

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CONTENTS.

1. Introduction.

The following account embraces the drainage basin of the Hennops River, to the east of the Johannesburg Railway Line.

The mapping, which was completed during May, is bounded on the north by a line drawn due east and west through Droogegrond Station (or Lyttelton Junction, as it is now called), on the west by the Johannesburg Railway line, on the south by the edge of the Pretoria degree sheet, which practically coincides with a line drawn east and west through a point midway between Kaalfontein and Oakmoor Stations, and finally on the east the survey was continued slightly beyond the Standerton or Old Natal Road. The area surveyed amounts to 107 square miles, over which 100 miles of boundary lines were traced.

The physical features are intimately connected with the geological structure. More or less parallel to the railway line, and at an average distance of about three miles, lies a continuous strip of high ground, known as the Langerand, traceable to the north as far as Pretoria. This range is composed of the Timeball Hill quartzites of the Pretoria Series, and corresponds therefore with the hills to the south of the Capital, which are marked by the Klapperkop and Schanskop Forts. The Langerand is succeeded by a narrow valley of shales, then follows a fairly extensive belt of dolomite, triangular in shape, giving rise to rather flat country on the south, but in a northerly direction to higher ground, and finally, at the apex of the triangle, culminating in a striking feature. This dolomite is succeeded on the north-east by the regular succession of the Pretoria Series. Between the Langerand and the railway line, about one mile north-east of Irene Station, lies the Paardekop, a conspicuous feature in the landscape, composed of dolomite, which here attains an elevation of 5,120 feet. From the summit of Paardekop a fine view can be obtained over this portion of the Hennops River.

The water supply is excellent all over this area, as one would expect from the occurrence, as well as the mode of distribution, of the dolomite. This subject will be again referred to in connection with the geological structure of the district.

The chief interest attaching to this part of the Hennops River Valley is the remarkable structure, which gives rise to a complete inversion of the lower portion of the Pretoria Series, below the dolomite. Moreover, the elucidation of the causes which have led to this abnormal feature throws much light on the general nature of those earth movements, the final result of which has been to change the strike of the Pretoria Series from east and west, north of Pretoria, to north-west and south-east a little beyond Hatherley. While the structure will be fully discussed below, it may be here briefly summarised by stating that the repetition of dolomite between two belts of the Pretoria Series, which is the main feature of the geological structure, is due to an anticline, complicated by a thrust-plane.

that along which the section across Hennops River Valley [illegible]

A study of this illustration shows that if we could replace the over-thrust masses of strata in their original position to the north-west, we should find merely a synclinal and anticlinal arrangement, which is exactly what occurs in the extreme south of our area, where the thrust-plane appears to have died out (see Fig. 2, Plate XXI.)

The view that the main structure of this part of the Hennops River Valley is that of an over-thrust anticline, satisfactorily accounts for the peculiar arrangement of the formations.

It would be interesting to enquire whether the movements and dislocations here described are connected with any other irregularities in the structure of the Pretoria Series elsewhere, and whether the results here given receive confirmation from such a comparison.

In the course of the detailed mapping of the area lying within an approximate radius of eight miles of the Capital, the amount of contortion, dislocation, and displacement, which the beds of the Pretoria Series south of the Magaliesberg Quartzite have undergone, was brought out with great clearness.* Examples were found of movements, varying from gentle undulations to a complete twisting round of segments of strata, previously dislocated by faults, in addition to duplications of series of beds over considerable distances. Now, in the case of all the main lines of fracture, it was found that they were reversed faults hading approximately to the N.N.W. It is well known that the difference between thrust-planes and reversed faults is only one of degree, and it is not unusual to find such a thrust-plane as above described in a district where there are also reversed faults. When we remember that the strike of the Pretoria Series rather suddenly changes to a south-easterly direction to the east of the Capital, it is clear that the structure of the Hennops River Valley is closely connected with that of the neighbourhood of Pretoria, both being the result of the same series of earth-movements.†

The Water Supply.

The Dolomite has long been known as the great water-bearing series of this country. Since the greater part of the area here dealt with consists of this formation, it is interesting to consider its water supply, especially as the centre of this district is only some 14 miles from Pretoria.

Owing to the peculiar geological structure, the V-shaped outcrop of dolomite on Rietvlei, and to the south-east of this farm, is underlain by Pretoria Series. As a result of this, we have a block of water-bearing strata cut off below by more or less impervious strata, conditions which would favour the presence of extensive underground water. Hence arises the important question as to the direction in which the ground water would flow. The presence of this water was proved by making a trench of a maximum depth of about 30 feet, which opened up a powerful spring at the junction of the shales underlying the dolomite, about 100 yards east of Hennops River on the central portion of Rietvlei. Since the amount of water present in the Hennops River is quite insufficient to support the idea that it is fed by this underground supply, and since there is no series of natural springs along the western boundary of the V-shaped dolomite outcrop, it is difficult to suppose that the underground flow is towards the west or north-west, especially considering the impervious character of the shales which pass beneath the dolomite. Owing to the easterly or north-easterly dip of the thrust-planes, it is more likely that the flow is towards the Pienaars River. This supposition, however, is likewise met by certain difficulties, since the upper waters of this river are very insignificant. Most probably the flow is nearly to the north, for the following reasons :—The high ground in the north-eastern portions of Rietvlei is approximately 400 feet above the level of The Fountains, near Pretoria, while the highest point on Bronkhorstfontein (177) is nearly 1,000 feet above the position of the Pretoria springs. On the boundary line between the farms Erasmusdam and Garstfontein occur two anticlines of dolomite and the structure‡ of this locality indicates that the lowest beds of the Pretoria Series have assumed a gentle synclinal arrangement, so that the upper beds of the Dolomite are nowhere at any great depth. This fact must be considered in connection with the big fault cutting across the northern parts of Rietfontein (448) and Rietvlei (221). The underground flow starting from the high ground on Bronkhorstfontein would be towards the N.N.E., until it would meet this fault, which would enable the water to drain into the dolomite underlying the syncline of the Pretoria Series on Erasmusdam, and eventually to find its way into Groenkloof and to The Fountains. The yield of the Pretoria main supply§ cannot, under any circumstances, be accounted for by the very small geographical catchment area south of The Fountains. The above considerations, however, of the water supply in the Hennops River Valley south of Irene, in connection with the peculiar faulted and anticlinal arrangement of the Dolomite, will help us to understand how this limited catchment area south of The Fountains is supplemented from an underground flow coming from a greater distance.

* See Chap. IV., in the "Memoir on the Geology of Pretoria and Environs."

† See paper "On Folding and Faulting in the Pretoria Series and the Dolomite," by A. L. Hall and F. A. Steart. Trans. S.A. Geol. Soc., Vol. VIII.

‡ See A. L. Hall—"The Geology of Pretoria and Neighbourhood," Chap. iii.

§ Op. Cit., Chap. V.