

January 21, 1858.

Dr. J. D. HOOKER, V.P., in the Chair.

The following communication was read :—

“ On the Physical Structure of the Old Red Sandstone of the County of Waterford, considered with relation to Cleavage, Joint Surfaces, and Faults.” By the Rev. SAMUEL HAUGH-
TON, Fellow of Trinity College, Dublin, and Professor of
Geology. Communicated by Dr. TYNDALL, F.R.S. Received
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After describing the general features of the district and giving his reasons for selecting it, the author proceeds to give a detailed account of the faults, joint surfaces, and cleavage planes, 345 in number, observed by him during the course of his survey.

The faults are nineteen in number and reducible to two pairs of rectangular systems. The bearings of these systems are E. $7^{\circ} 30'$ N. and E. $54^{\circ} 22'$ N. The other faults, which form nearly right angles with the preceding and may be called Conjugate Faults, have the following bearings, N. $3^{\circ} 45'$ W. and N. $33^{\circ} 24'$ W.

The author considers that the existence of two systems of conjugate faults indicates two distinct systems of upheaving force in the district; a supposition which is strongly confirmed by the fact that the average strike of the beds is E. $10^{\circ} 46'$ N., a direction intermediate between those of the systems of faults. He then demonstrates from 345 observed planes, that the systems of joint and cleavage planes are also conjugate systems, reducible to four, of which two are identical with the two conjugate systems of faults already established. The average observed angles between the conjugate axes of these four systems of planes are $89^{\circ} 11'$, $91^{\circ} 52'$, $91^{\circ} 20'$, and $90^{\circ} 30'$ respectively; and the bearings of their cleavage planes are—

Cleavage.

7° 46' North of East.
 33° 31' North of East.
 30° 30' South of East.
 10° South of East.

Faults.

7° 30' North of East.
 34° 22' North of East.

The cleavage planes are distinguished from the joint planes by a peculiar flaggy or platy structure developed in the rock-mass, parallel to their direction. This structure the author thinks to be the result of pressure; and that it indicates that the cleavage planes are perpendicular to the lines of maximum force; he considers the cleavage planes to have been developed while the rock was yet soft. The joint planes, on the contrary, which are conjugate to the cleavage planes, are considered as perpendicular to the lines of minimum force of compression; they were formed by the shrinking of the rock mass, were subsequent to the cleavage planes, and formed when the rock was hard.

Having established the geometrical relations of the structural planes of the conglomerate, the author then deduces from them the mechanical forces which have been at work in bringing the district to its present condition and form. He believes that the method he has adopted in reference to the conglomerate of the county of Waterford is applicable to the physical structure of other districts; and that his results, if confirmed by corresponding results in other districts, of which he is confident, will prove to be a substantial addition to the arguments in favour of the mechanical theory of slaty cleavage.

The paper was accompanied by four diagrams illustrative of the cleavage and joint planes of Portally Head, Swiny Head, Shanooan Head, and of the reversed fault at Portnashrughann.