William Gault's detailed "Observations on the Geology of the Black Mountains," a coloured diagram is given. The Appendix contains papers by Mr. Joseph Wright on "Recent Foraminifera of Down and Antrim," and by Messrs. Swanston and Lapworth on the "Correlation of the Silurian Rocks of Co. Down."

THE Twentieth Report of the East Kent Natural History Society is, on the whole, satisfactory. It contains abstracts of several good papers read at the meetings. The Society has ninety-three members.

EXCAVATIONS in the "Dragon Cave" at Mixniz, Styria, have been already noticed (NATURE, vol. xviii. p. 618). The diggings made in June, 1878, by the Anthropological Society of Gratz, have brought to light some bones bearing indistinct marks of cutting and percussion. Above the stalagmitic layer over the hearth-stuff some bones were found, in loam, well preserved, but probably derived from an older site. They are greenish, and partly of an intense bluish-green tint; and Prof. C. Doelter finds that their composition approaches that of turquoise [bone-turquoise?]. A full account by Prof. R. Hoernes will be found in the *Proc.* Imp. Geol. Instit. Vienna, August 31, 1878.

THE additions to the Zoological Society's Gardens during the past week include a Yellow Baboon (*Cynocephalus babouin*), from West Africa; two Ring-tailed Lemurs (*Lemur catta*), from Madagascar, presented by Mr. G. A. Shaw; a Green Monkey (*Cercopithecus callitrichus*), from West Africa, presented by Mr. J. Williams; a Common Fox (*Canis vulpes*), British, presented by Mr. Sutton Sharpe; a Woodcock (*Scolopax rusticola*), European, presented by Messrs. E. and W. H. Davis; a Common Swan (*Cygnus olor*), European, presented by Capt. Marx; a Ring-tailed Lemur (*Lemur catta*), from Madagascar, deposited; an Ocelot (*Felis pardalis*), from America; a Cereopsis Goose (*Cereopsis novæ-hollandiæ*), from Australia; three Yellow-winged Blue Creepers (*Cœreba cyanea*), from South America, purchased.

ON HELIOTROPISM IN PLANTS

THE heliotropic phenomena in plants form the subject of a monograph by Herr Wiesner, the first part of which has been recently communicated to the Vienna Academy. The following outline from the *Anzeiger* of the Academy will give an idea of some of the fruits of the author's researches on this important subject.

The first section treats of the history of the subject. In the second section the author studies the *influence of light* on heliotropism. The experiments were made in the light of a gas flame which burned under a constant pressure with a uniform intensity (luminous power = 6·5 spermaceti candles). The unit for the measurement of the light-intensity was the strength of this flame at the distance of one metre. It was found that in heliotropism three cardinal points of light-intensity are to be distinguished; an upper limit, a lower limit, and between the two an *optimum* of light intensity. Thus with decreasing intensity of light the strength of the heliotropic effect increases to a certain point, and beyond this point decreases. The lower limit referred to coincides with the lower limit of light-intensity for the stoppage of growth in length, while the upper limit does not coincide, or only occasionally coincides, with the upper limit of light-intensity for growth in length, for in the case of plants very sensitive heliotropically it lies higher, and in less sensitive plants lower, than the upper limit for growth in length. The mode of arrangement of the experiment in gas-light did not permit of determining in all cases the limiting values of the light-intensities; thus, for example, the upper limit for the heliotropism of etiolated shoots of *Salix alba*, and of the hypocotylous portion of the stem of *Viscum album*, and the lower limit for the heliotropism of the growing stem of vetch could not be ascertained. The former lies above 400, the latter far below 0·008. The optima were found to lie between 0·11 (the growing stem of the pea) and 6·25 (etiolated shoots of *Salix alba*). Both with gas-light and with natural light it was ascertained that beyond a certain intensity no growth in length occurs.

The third section treats of the relations between the *refrangibility* of the light rays, and the heliotropic effects. The experiments were made partly in the objective spectrum, partly in varieties of light, got by sending white light through coloured solutions. . . . It was proved that portions of plants very sensitive heliotropically, *e.g.*, growing stems of *Vicia sativa*, undergo curvatures in all kinds of light, even in ultra-red and ultra-violet, with the exception of yellow. The maximum of the heliotropic force of light lies at the boundary between violet and ultra-violet; a second (smaller) in the ultra-red. From both maxima the power of the rays to produce heliotropism decreases gradually on to the yellow. Portions of plants little sensitive heliotropically, are no longer influenced by orange, or by red and green, or even (in the case of etiolated shoots of *Salix alba*) by ultra-red rays. The yellow rays quite stop the heliotropism, for, *e.g.*, in pure red a quicker and stronger heliotropism occurs than in a light which gives yellow besides red.

In the fourth section experiments are described on the joint action of (positive and negative) heliotropism and (positive and negative) geotropism. It is here shown, *inter alia*, that, in the case of plants very sensitive heliotropically, the geotropism is, at the optimum of light-intensity, apparently extinguished, even in strongly geotropic organs; further, that in many organs (growing stem of the pea), the heliotropic and geotropic powers of curvature disappear simultaneously; in others, however (stems of cress), the younger portions of the stem are more strongly heliotropic than the older, and the oldest after-growing portions of stem no longer show bendings in the light, but, through drawing action on one side (the heliotropic overhanging point of the stem), show apparently heliotropic curvatures chiefly due to growth, which are then counteracted by negative geotropism.

The arguments which go to prove that heliotropism is due to the phenomenon of unequal growth upon unequally-lit sides of an organ are set forth in the next section, and proof is offered that, for heliotropism as well as for growth in length, free oxygen is necessary.

The last chapter furnishes proof that the conditions for heliotropism remain constantly the same during its course, and coincide with the conditions for growth in length; further, that heliotropism (and the same holds good for geotropism) occurs as a phenomenon of induction. In this chapter it is also shown that when light induces heliotropism in an organ, a fresh heliotropic or geotropic induction meets with resistances, and can only come into action after extinction of action of the first; and that successive impulses of light and gravity, of which each by itself is capable of producing certain effects, do not have their actions added together when the effects that should be obtained separately are in the same direction, *e.g.*, one and the same side of the organ is helped in its growth in length.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 5.—"On a Machine for the Solution of Simultaneous Linear Equations," by Sir William Thomson. Let B_1, B_2, ... B_n be n bodies each supported on a fixed axis (in practice each is to be supported on knife-edges like the beam of a balance).

Let P_{11}, P_{21}, P_{31}, ... P_n be n pulleys, each pivoted on B_1;
   P_{12}, P_{22}, P_{32}, ... P_{n2} ,, ,, B_2;
   P_{13}, P_{23}, P_{33}, ... P_{n3} ,, ,, B_3;
....

,, C_1, C_2, C_3 ... C_n, be n cords passing over the pulleys;
,, D_1, P_{11}, P_{12}, P_{13}, ... P_{1n}, E_1, be the course of C_1;
,, D_2, P_{21}, P_{22}, P_{23}, ... P_{2n}, E_2, ,, ,, C_2;
....

,, D_1, E_1, D_2, E_2 ... D_n, E_n, be fixed points;
,, l_1, l, l_3, ... l_n be the lengths of the cords between D_1, E_1, and D_2, E_2, ... and D_n, and E_n, along the courses stated above, when B_1, B_2, ... B_n, are in particular positions which will be called their zero positions;

Let $l_1 + e_1$, ... $l_2 + e_2$, ... $l_n + e_n$ be their lengths between the same fixed points, when B_1, B_2, ... B_n are turned through angles x_1, x_2, ... x_n from their zero positions;

(11), (12), (13), ... (1n),
(21), (22), (23), ... (2n),
(31), (32), (33), ... (3n),
....