of a temporary submergence to spread out the debris with such uniformity. During the retreat of the waters, pluvial action might perhaps wash away the softened soil in the regular manner described.

ALFRED R. WALLACE

The Number of Species of Insects

PROF. HUXLEY is very much within the mark when he estimates the species of insects at "about 100,000, if not more." Were I to estimate the number of described species at 200,000, I believe the figures would also fall short of the truth, even allowing a liberal margin for synonyms. In one order alone (*Coleoptera*) it is estimated that 80,000 species have been described.

I could enlarge upon the bearing these figures have upon theories on the geographical distribution of animals, but content myself with the remark that the groups of insects selected by writers on the subject are those in which colour is most prominent and structure least differentiated.

Lewisham, January 12

R. McLACHLAN

[We sent the above to Prof. Huxley, who has appended the following note.—"It was not my object to give an accurate estimate of the total number of species of insects. Gerstaecker, in the new edition of Broun's 'Thier-reich,' gives 200,000 as the total number of species of *Arthropoda*; but I dare say that Mr. McLachlan has good grounds for the claim he puts in for insects alone.

"T. H. HUXLEY"—ED.]

Meteor

PRECISELY at 6 P.M., on the 19th inst., I saw a splendid meteor traverse the sky from a point about midway between Orion's belt and the Pleiades to a point directly under the moon, and about 10° above the horizon. It was pure white and dazzling, lasted about five seconds, emitted no sparks, except at the moment of disappearance, and was about half the size of the moon at the time.

R. M. BARRINGTON

Bray, Co. Wicklow, January 21

Diurnal Barometric Range at Low and High Levels

YOUR notice under this head (vol. xv. p. 187) of my paper on the daily inequalities of the barometer at Mount Washington and Portland, Maine, has hit a blot of which I was unconscious until now. Had I been more than a student writing one of his first essays in meteorology, I should probably, like yourself, have suspected something wrong in the Portland curve. The morning maximum and the afternoon minimum, as you point out, occur very much earlier than is usual.

Differences varying from +0.027 inch to -0.004 inch between your averages of General Myer's figures and those given in my paper did not surprise me, as mine were intended to represent the temperature of 60° F., while you have probably taken the observations either as already reduced to 32°, or have yourself reduced them to this temperature. My own impression is and was that the printed observations are not corrected for temperature, and in order to make the comparison with as little change as possible in the original figures for the three stations I brought each to something near a mean temperature for the three attached thermometers. Unfortunately, and here comes the blot, I now find that, by some mischance, in taking out the differences for Portland the external temperatures were taken instead of those by the attached thermometer. I exceedingly regret this, and shall as early as practicable make the required correction.

Fortunately this error does not affect the purport of my paper or the suggestions which I offer in it towards the explanation of the long-veiled question of the cause or causes of the daily inequality of the barometer.

An acquaintance with the variations of the daily barometric curves, which depend on change of season and difference of locality, would undoubtedly be of assistance in drawing these curves when the observations for only a few hours are given, but the six hours for which the Portland figures are given are so well distributed as to leave little uncertainty as to the general form of the curve in this case. I should not, however, be satisfied with any curve for the Portland observations which, when analysed by the usual formula and reconstructed from the co-efficients thus obtained, did not reproduce the original observations, and also the interpolated values for the other hours, within a limit of error of 0.001 inch. Unless your curve can stand this test I shall not be satisfied with your deductions as to the epochs of maximum and minimum values. Having had much experience in drawing

such curves, I venture to assert that the Portland observations, whether taken as they are printed or after a correction for temperature, will still give the morning maximum and afternoon minimum of the barometer much earlier than is usually the case in this country. If my paper draws attention to any singularity of this kind it will mitigate the disappointment caused by the mistake in the temperature correction.

I append the times of maxima and minima for Portland, May, 1872, as corrected; also similar data for five years at the Naval Observatory, Washington, U.S., and for Oxford, England.

Times of Daily Maxima and Minima of the Barometer for the Month of May.

	First Min.	First Max.	Second Min.	Second Max.
Portland, Maine :—	h. m.	h. m.	h. m.	h. m.
1872	1 30	7 30	15 30	21 20
Washington, U.S. :—				
1862	1 30	9 0	17 30	22 40
1863	1 30	8 20	17 30	22 40
1864	1 20	10 10	17 0	22 0
1865	1 50	9 0	16 0	22 30
1866	1 20	8 30	17 0	21 30
Mean for five years	1 30	9 0	17 0	22 16
Mean from calculation as given by Prof. J. R. Eastman ...	2 0	8 0	16 50	22 20
Mean for sixteen years at Oxford, England	3 55	7 55	16 25	22 45

Liverpool, January 5

W. W. RUNDELL

Former Climates

It appears to be established that a climate favourable to the growth of coal plants and coral builders has prevailed in latitudes where the sun now shines for about seven months out of twelve.

Without inquiring how it came about that a warm sea once washed polar coasts, it would be interesting to learn whether the plants and animals concerned in the production of coal forests and coral reefs can flourish under these conditions of light supply.

Holmwood, Putney Hill

D. PIDGEON

Tape-worms of Rabbits

HAVING had occasion to dissect a number of wild rabbits, I have been surprised to find that the majority of them are infested with a large species of tape-worm. Can any of your readers inform me whether the life-history of this parasite has ever been made out? The case appears to be a remarkable one, because the host cannot here be suspected of ever taking animal food. Unless, therefore, we suppose that the tape-worm of a rabbit differs from other tape-worms in not passing through a hydatid stage, it becomes difficult to explain the very general occurrence of this species.

GEORGE J. ROMANES

POLARISCOPE OBJECTS

THE following is an interesting combination :—When the polariser and analyser are crossed, insert a concave plate of quartz cut parallel to the axis, with its axis inclined at 45° to that of the polariser, add to this a quartz wedge cut also parallel to the axis, having its axis placed perpendicular to that of the concave plate. The coloured circles, shown by the concave plate alone, will be seen to be displaced in the direction of the thicker edge, to a distance dependent upon the angle of the wedge. Also, as the wedge is made to slide in or out, the circles will be seen to expand or contract, according as the thicker or thinner part of it is presented to the field of view.

The explanation of this is to be found in the fact that a combination of two crystalline plates is optically equivalent to a single plate, whenever the axes of the plates are either parallel or perpendicular to one another. This follows immediately from a comparison of the mathematical expressions for the intensity of the light at any

part of the field in the two cases. The expressions will be found in Verdet (*Oeuvres*, tome vi. p. 110), who further remarks that, if the two sections are parallel, the addition of the second is equivalent to an augmentation, or a diminution of the thickness, according as the two plates are both positive or both negative, or are one attractive and one repulsive. If the principal axes of the plates are perpendicular, the addition of the second plate is equivalent to a diminution of the thickness when the plates are of the same sign, and to an augmentation of thickness when they are of opposite signs.

When, as in the case proposed, the second plate is a wedge, the effect of the combination will be the same as if the flat side of the concave plate were cut away wedge-wise, but in direction opposite to that of the actual wedge. Optically, then, the bottom of the concavity will be thrown towards the side on which the combination is optically thinnest; *i.e.*, on which the actual wedge is thinnest.

The sliding of the wedge will not alter the displacement of the centre, which is dependent on the angle, and not on the thickness of the wedge, but it will alter the total thickness of the compound plate, and consequently the diameter of the circles.

In addition to the above, I may mention another piece devised and constructed for me by Mr. C. D. Ahrens. This consists of two quartz cones, one hollow, the other solid, fitting into one another; one cone is of right-handed, the other of left-handed, quartz, and the axis of each is parallel to that of the crystal. The polarisation figure due to this combination is of course a series of concentric circles, which expand or contract when the analyser is turned in one direction or in the other.

If the field of view be examined at various distances from the centre, it will be found that there is a distance, viz., where the right and left-handed cones compensate one another, at which there is no colour, but only an alternation of light and darkness. In the immediate neighbourhood of this the red and orange assume the brown and drab hues due to low illumination, in accordance with Helmholtz's experiments; beyond this the colours are more brilliant; while at still greater distances, where the thickness of one cone much exceeds that of the other, the colours become more pale.

Combe Bank

W. SPOTTISWOODE

MUSEUMS

THE subject of Museum management and arrangement having lately been commented upon by Prof. Flower in a lecture delivered at South Kensington Museum, and printed in *NATURE* of December 14, 28, *et seq.*, and also by Prof. Boyd Dawkins in an address to the Manchester Literary and Philosophical Society, noticed in *NATURE* of December 7, it may not be an inopportune time to suggest to those who have the management of these institutions the desirability of their mutual co-operation in order to develop them to their fullest extent. The great progress which has been made during the past few years in the establishment of museums in the various provincial towns of this country is highly creditable to those who have assisted in the movement, and the influence which they might have, if properly utilised and developed, on the education and intellectual progression of the people, gives them a forcible claim to national and individual support.

There is no doubt that the present financial support given to museums is totally inadequate to maintain them in an efficient state, and we hope to see this remedied to some extent in the next session of Parliament, by the adoption of Mr. A. J. Mundella's Bill for Increasing the Library and Museum Rate, the penny rate not realising sufficient money, except in large and wealthy towns, to serve the purpose for which it is intended. Mr. Mun-

della's Bill gives the power to levy a rate, not exceeding 2d. in the pound, for the purpose of establishing and maintaining free libraries and museums, and in those towns where there is no museum, but only a library or libraries, the rate not to exceed 1½d. in the pound. This slight increase would not press heavily on any section of the ratepayers, while it would enable many of our libraries and museums which are now languishing for want of funds to go on in their wide sphere of usefulness with increased vigour and zeal.

The important conference of the mayors of towns and chairmen of museum committees, which was held in Birmingham on the 5th instant, to discuss and urge the claims of museums and galleries of art to some of the surplus funds remaining from the International Exhibition of 1851, and also to the duplicates which are stored away in Government collections, is a step in the right direction, and we hope that it will be productive of good results.

With the more general diffusion of education among the great masses of the people which it is hoped will result from the passing of the recent elementary education acts, the class of readers and students will be greatly enlarged, and we might naturally look for something being done by the Government to meet the increased demand for books and objects of study which is likely to follow; and we see no reason why museums themselves should not be occasionally converted into schoolrooms where teachers could bring their zoological, geological, and other natural science classes, and find well-arranged material for illustrating their lessons. Of course we take it for granted that these sciences will eventually be taught in all elementary schools under Government control.

With regard to the preservation and arrangement of specimens in museums, those who had the pleasure of listening to Prof. Flower's lecture cannot have failed to carry away some useful suggestions, and his remarks, together with those of Prof. Boyd Dawkins on the neglected and unsatisfactory state of many of our museum collections, are well worth the consideration of those in charge of them. What ought fairly to be the aim and scope of a provincial museum is a question which each town must to a great extent answer for itself, as it must depend on the resources of the neighbourhood and on the facilities possessed for obtaining certain classes of objects; and curators would do wisely to content themselves with doing only what can be done thoroughly and well, be it ever so little, and not to accept objects simply with the view of filling empty cases. We are well aware that curators are not always responsible for the incongruities which get into a museum, and if the refusal of objects were always left with them, we should not have museums sinking into advertising establishments or mere curiosity shops. We do not, however, intend now to go into this subject, but in order that all the important matters connected with the work of museums may receive full and careful consideration, we would suggest that an association be formed, to consist of curators and others engaged in the arrangement of museums. Such an association need not in any way interfere with those now existing, as there is a sufficiently wide field for discussion and action included in the work and development of museums without treading on the ground occupied by other associations. By holding periodical meetings and constantly changing the place of meeting from town to town, the various museums of the kingdom could be inspected, and their contents and plan of arrangement discussed and criticised. Friendly communications would thus be opened among all museums, and exchanges could be arranged to their general advantage. Much might be said as to the necessity and work for such an association, but we content ourselves, for the present, with suggesting it, and now leave the matter to be taken up by those most intimately concerned.

E. H.