

mining a Ceratopsian skull, beneath which it lay. Being thus accidentally found during work with a heavy pick, it was badly shattered, but it is believed that all the fragments originally preserved have been recovered.

MR. E. C. CHUBB, the curator of the Durban Museum, is to be congratulated on the admirable "General Guide" which he has prepared for the aid of visitors, a copy of which has just reached us. Mr. Chubb has evidently made the most of the collections under his charge, though it would seem that great gaps have to be filled, even in so far as African mammals are concerned. If we may judge from this guide, neither the elephant nor the giraffe is yet represented here. When a new edition of this guide is issued we would suggest that the statement that the "lampshells," or Brachiopods, are possibly related to the starfishes should be corrected, while in regard to the information concerning flexible sandstone the fact might be added that it is found in India and Brazil. At the present time the Durban Museum occupies no more than the first floor of the south block of an imposing pile of buildings serving also as an art gallery and public library, and apparently yet other functions. In the course of time it is to be hoped the Natural History Department will either oust its rivals or find new and more commodious quarters elsewhere; as matters stand, the space allotted to it is inadequate.

MR. E. P. MEINECKE, in U.S. Dept. Agric. Bulletin, No. 275, entitled "Forest Pathology in Forest Regulation," gives the results of an investigation, as regards the incidence of wounds and disease, of 160 felled trees of *Abies concolor*, varying in age from 60 to 258 years. These trees were representative of the ordinary condition of the species under natural forest conditions in Oregon. Only one-fourth of the trees were found to be free from wounds. The rest had all been injured at one time or another by lightning, fire, frost-crack, etc., or by a combination of these, and as the wounds permitted infection by fungi, decay had set in. After the trees had reached eighty or ninety years of age, 70 per cent. were more or less badly wounded; and at 106 years, 80 per cent.; but serious decay of the timber rarely set in until about the age of 130 years. Fire, usually caused by lightning, is the greatest enemy. The management of the forest should be modified by the pathological conditions, as it is evident that much may be done to avert decay and destruction of valuable timber by timely removal of wounded and badly suppressed trees, and by fixing the felling rotation at 130 to 150 years.

THE richness of Sweden in water-power, and Denmark's natural poverty in any sources of power, has led to Sweden exporting electric power across the Sound. The works are established in the small river Låga, in Småland, and the current is carried by overhead wires to Helsingborg, and thence by three submarine cables under the waters of the Sound to Marienlyst, north of Elsinore, on the island of Seeland. According to *La Géographie* (vol. xxxi., No. 2), the Swedish power station sends 500 h.p. to Denmark, but the company undertakes to increase this to 5000 h.p. Precautions have been taken so far as possible to prevent the cables being fouled by the anchors of ships.

THE Royal Italian Geographical Society has issued as one of its special memoirs a handbook and index to the names which appear on the Austrian Staff map (1:75,000) of the Alto Adige, the new province of Italy lying north of the Trentino ("Prontuario dei nomi locali dell' alto Adige"). The index itself, apart from the introduction, runs to more than one hundred pages, and contains all the names on the fourteen

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sheets of the map, with their Italian equivalents. Pending the preparation of a new map, this index should be of great value, as many of the places are difficult to identify from the German versions of their names, which often bear no relation to the Italian. The work has been done under the direction of Signor E. Tolomei.

WITH the view of increasing the commercial utility of cobalt, Dr. H. T. Kalmus, of Queen's University, Kingston, Ontario, has carried out a number of investigations of the physical properties of the metal and its alloys for the Mines Branch of the Department of Mines of Canada. The fifth of these investigations deals with the magnetic properties of pure cobalt and of the alloy Fe_2Co , and has been conducted by Dr. Kalmus and Mr. K. B. Blake. The B, H curves of both materials have been obtained by the Burrows method in use at the American Bureau of Standards. For pure cobalt the value of B for H=100 is only about 5000, while older observations had given 8000. At H=150 B has risen to 6300, and shows no sign of the material being magnetically saturated. The Fe_2Co alloy, when cast, is very liable to fine cracks, but after forging is more than twice as strong as pure iron. At low fields its magnetic permeability is less than that of pure iron, but at fields exceeding 8 it is greater, and for fields of the order 50 to 200 is approximately 25 per cent. greater. The hysteresis loss is considerably less than that of transformer steel, and its electrical resistance about the same as that of pure iron.

A PAPER by the late Lieut. F. Trevor Wilkins (Northumberland Fusiliers), read at the Institution of Mechanical Engineers on October 20, gives an account of some trials of a small Diesel engine at the University of Birmingham. The manner of conducting these trials and reducing the results enabled figures to be presented additional to those usually given in such investigations. The indicator diagrams have been redrawn upon a heat-energy chart, and by this means any differences between the theoretical and practical cycles are clearly exhibited. The amounts of heat passing to the cylinder walls and to the exhaust were determined accurately. The heat flow during the compression and expansion strokes was estimated separately, and the period during which this heat flow takes place was indicated definitely. At full load the thermal efficiency, heat to jackets, and heat to exhaust are respectively 42.1, 29.6, and 28.3 per cent., these being the results of the test. The corresponding figures from the energy diagrams are 42.5, 25.3, and 32.2 per cent.

OUR ASTRONOMICAL COLUMN.

THE FIREBALL OF OCTOBER 20.—Mr. Denning writes that forty-six observations of this brilliant object have reached him. It was seen from widely distant stations, the most northerly being Rothes (Elgin), and the most southerly Totteridge (Herts) and Bristol. The fireball was a splendid one, and it traversed a long flight of about 252 miles, from over a place 60 miles N.W. of Edinburgh to 50 miles E. of Whitby, Yorks. Its elevation decreased from 68 to 25 miles, and its velocity was about 17 miles per second. The radiant point was near ζ Herculis, situated low in the N.W. by W. sky at the time of the apparition. There is no well-known meteor shower from this region in the autumn, but bright meteors have sometimes been observed from the same astronomical point at various times of the year, and this point near ζ Herculis forms the chief focus of a well-defined meteoric shower visible during the last half of May.

THE ORIONID SHOWER OF 1916.—These October meteors were fairly well seen this year between October 20 and 25 at Bristol. There were two showers, one at $92^{\circ}+15^{\circ}$, the true Orionids, and a richer one at $98^{\circ}+14^{\circ}$, near γ Geminorum. These results appear to substantiate observations made in 1900 and 1903 at Bristol, when the Geminids exhibited greater activity than the Orionids. The two showers, lying so near together, are very liable to be confused; in fact, in some cases it is impossible to say to which radiant the meteors are conformable.

Of the other showers belonging to this usually prolific meteoric epoch, only a few of well-pronounced character were visible this year. There were, however, some slow meteors from a sharply defined radiant at $72^{\circ}+66^{\circ}$, and some very swift, streaking meteors from a point at $121^{\circ}+43^{\circ}$. Several of the true Orionids, observed on October 20, were recorded at two stations, and their real paths have been computed.

ULTRA-VIOLET RADIATION FROM THE SUN.—Prof. Birkeland has recently given an account of some observations of the zodiacal light, and of the registration of the ultra-violet radiation of the sun (*Cairo Sci. Journ.*, vol. viii., p. 287). The most effective rays of the zodiacal light appear to have a wave-length of about 3200 Å.U. and under, so that, in attempts to obtain photographs, lenses of quartz, or mirrors of Mach's metal (67 Al+33 Mg) or of nickel, should be employed. Regarding the zodiacal light as a manifestation of the general electrical activity of the sun, Prof. Birkeland was led to investigate the ultra-violet radiation of the sun itself by the use of a filter consisting of a silver film which was opaque to visible light. Sunbeams transmitted through such a film were received by a photo-cell and registered in the usual manner. Variations of intensity were observed, and there was some slight evidence of a relation to changes in horizontal magnetic intensity. While allowing that some of the observed variations of the ultra-violet intensity were probably due to atmospheric differences, Prof. Birkeland finds reason to believe that variations also arise through real changes in the electrical state of the sun. The possibility of extending such observations to stars and planets by the use of large concave mirrors, say 4 metres in diameter, is suggested. A new analysis of celestial bodies, giving information as to their general electrical states, might thus be founded.

THE SOIL SURVEY OF WISCONSIN.¹

FOLLOWING the lead set by the American Bureau of Soils, the State of Wisconsin has arranged for a soil survey, and is publishing the results in a series of attractive booklets, well provided with maps, diagrams, and illustrations. First of all, there was issued in 1911 the so-called "Reconnaissance Soil Survey of Part of North-West Wisconsin," in which a general account was given of the geology, climate, soil, and agriculture of the area. This has now been followed by more detailed accounts of the various counties. It is proposed to complete the work by issuing a series of bulletins dealing with the management of the different types of soil, and on the 1-in. maps issued with these reports the various soil types are so clearly defined that the farmer would have no difficulty in locating his land, and so discerning which particular bulletin would give him advice as to cropping and management.

The region lies wholly within the great Mississippi valley, and its main topographical feature is the rela-

¹ Wisconsin Geological and Natural History Survey: Bulletins 28-32 Soil Series, Nos. 2-6, and Bulletins 37-40 (Soil Series, Nos. 7-10).

tively level or gently sloping surface of the land. Like other parts of the valley, it is an undulating plain into which lesser valleys have been cut by the rivers and streams.

The underlying rocks belong to the Cambrian or pre-Cambrian systems, and include crystalline rocks, sandstone, and limestone (mainly magnesian limestone). But on the whole the soils are not derived from the rocks immediately below them. Upon the broad uplands are extensive deposits of Glacial drift which in many cases retain the general forms left by the great ice-sheets that invaded this region. The lakes are here intimately related in origin to the Glacial deposits. There are also extensive wind deposits of loess over large portions of the uplands. In many of the valleys are thick deposits of loose sand and gravel, which assume the form of terraces.

The climate is not influenced by the Great Lakes, but it is by the storms that move eastward along the Canadian border and those that drift up the Mississippi valley from the south-west. As in other parts of the northern Mississippi valley, extremes of temperature prevail, the summer being warm, with abundant rainfall, and the winter cool and relatively dry. The mean temperature of the summer months is about 65° - 70° F.; in January and February about 10° F.; the extremes range from about 105° F. in the summer to -48° F. in winter.

Originally the land was covered with hardwood and pine, the latter being especially abundant on the sandy lands along the rivers. Much of this still remains, and there is considerable land available for agricultural settlement. Only in the west of the area do the thinly wooded and prairie lands occur.

The first settlers after the explorers and fur-traders were lumbermen, and their way into the country was by boat on the Chippewa River. But fifty or sixty years ago the agricultural settlement began, and now all the ordinary crops are raised in quantity, oats being the most important cereal, followed by maize, barley, and wheat. Among the special crops cultivated in certain districts are potatoes, sugar-beets, tobacco, peas, and maize for canning. Dairying is a particularly important industry; and it has further given rise to the well-known researches of Woll on feeding problems, and of Babcock and Russell on the composition of milk and the estimation of fat.

Typical analyses are given of the various soil types; as usual in the States, they are almost wholly mechanical analyses, only very few chemical data being given. In studying the results it must be remembered that the terms have very different meanings from those assigned to them in this country. The substances indicated by the analysis owe their properties to their sizes, and therefore the names given to them are intended simply to define the diameters of the particles, but unfortunately no international agreement has yet been reached, and hence the same name is used in different countries for wholly different-sized particles. Thus the terms have the following meanings in American and British surveys respectively:—

Mean diameter of particles, mm.

	United States	Great Britain
Fine gravel ...	2 -1	Above 1
Coarse sand ...	1 -0.5	1 -0.2
Medium sand ...	0.5 -0.25	Not used
Fine sand... ..	0.25-0.10	0.2 -0.4
Very fine sand...	0.10-0.05	Not used
Silt	0.05-0.005	0.04-0.01
Fine silt	Not used	0.01-0.002
Clay	Below 0.005	Below 0.002

Direct comparison with British soils is therefore impossible, a circumstance much to be regretted, as in