

exists there, above clouds transformed by the sun into flakes of light, adds to the beauty of the spectacle, and fills the soul with inexpressible admiration.

We do not yet know exactly to what cause to attribute the production of a luminous contour around the shadow projected upon vapours or mists. Some observers have thought that these phenomena are due to the diffraction of light, but it is possible that they have a common origin with the rainbow. What tends to confirm this opinion is the necessity for the presence of the vapour of water as a necessary condition of the phenomenon: if it is the result of diffraction, it ought to appear as well upon a white wall, or any kind of screen, as upon a cloud. It is possible, moreover, to study these curious phenomena by means of experiments upon the earth; by suitably arranging screens of silk or muslin saturated with water, which resemble a cloud, we may expect to be able to produce the phenomenon. M. Leterne points out another excellent method of studying it. On a spring morning, when the sun, about 15 or 20 degrees above the horizon, has warmed the atmosphere a little, and has produced a light condensation of vapour upon the grassy borders of the roads, one may see his silhouette projected upon the humid verdure, surrounded by a luminous contour, in which is seen the colours of the spectrum, the red, however, being strongest.*

THE GEOLOGICAL SURVEY OF INDIANA

GEOLOGY is a branch of Science which specially commends itself to the fostering care of Governments, paternal or otherwise. More particularly is this true of a new country, where, in the imagination of the settlers, untold wealth has yet to be dug out of the earth, if only they could discover in what quarter best to look for it. Accordingly, in not a few of our colonies and in a number of the States of the Union, geological and mineralogical surveys have long been at work, originated and continued at the public expense. In most cases, of course, the first aim of such surveys, and in fact the very justification of their existence in the eyes of practical and by no means scientific legislators, is the finding of mineral wealth. If they were begun from the lofty scientific point of view they would fail, and deservedly. But when a really able scientific man gets the charge of one of them, and has at the same time that mother-wit and knowledge of the world which scientific men so often lack, he may not only attend to the rigid economics of his paymasters, but do great service to geology. His aim is to show the public that a strictly scientific basis is the only one on which a mineral survey to be of any value can be conducted. And this is so obvious that if it is simply and clearly stated, it for the most part commends itself to the common-sense of public men. In laying this necessary basis and then in carrying out the survey for economic minerals the geologist may both pave the way for an enormous increase to his country's industry and wealth, and add much of permanent interest and importance to the common stock of geological knowledge.

Perhaps the most notable illustration of the successful accomplishment of this double mission is furnished by the career of Sir William Logan, whose practical kindly ways enabled him to triumph over the shortsightedness of colonial obstructionists, and whose patient and sagacious labours among the rocks of Canada have made his name honoured and familiar all over the world, and have conferred distinction also upon his country. In the United States, too, fostered by the liberality of the Legislatures, a number of admirable State surveys have been made, or are still in progress. Under the auspices of such men as James Hall, Owen, the Hitchcocks, the brothers Rogers, Hayden, Whitney, Blake, Cook, and others, not only have maps been constructed, but elaborate reports have

* *Comptes Rendus*, t. LXXVI. p. 786.

been published, embracing, in addition to the paramount economics, much valuable information in geology, mineralogy, and palæontology.

One of the latest of these State surveys is that of Indiana, which was started some four years ago under the direction of Prof. E. T. Cox. Like those already referred to, it was organised by the authorities "for the purpose of collecting information designed to promote the interests of agriculture, arts, manufactures, and mining." But it was furnished at the same time with an analytical laboratory "for analysing such ores and substances as may be deemed useful to the State," and with space "to build up a geological and natural history cabinet," while in order to render its labours as speedily serviceable as possible, an annual report of progress was required to be issued.

Prof. Cox has evidently a hard task before him. He has been invited to become a kind of depository of all the mining information in the State. He is to see that trustworthy mineral surveys are made, and at the same time he is expected to look after the laboratory and infant museum at Indianapolis and—perhaps most laborious but not least useful of all—to receive everybody who wants to know about coal, iron, or other mineral produce, and to collect and furnish to such inquirers all the information procurable. He generously says in one of his reports that this latter part of his duties "has always given him pleasure," though he confesses that it has consumed a considerable portion of his time. Fortunately he can count on the help of a small but apparently able staff of assistants, and notwithstanding all the obstacles in his way he has succeeded in getting through a large amount of work which, though not yet of high scientific value, must bear most importantly upon the future development of Indiana.

Three volumes of reports with maps have been published, bringing the account of the progress of the Survey up to the end of last year. Each of these neatly printed and not too bulky octavos describes several counties of the State with reference chiefly to the distribution of economic minerals; and the maps which accompany it, though roughly and cheaply executed, are clear and must be of infinite service to the many speculators and others who every year come in increasing numbers into the state in search of mineral investments. The coal-field of Indiana, though only a part of the larger basin of Illinois, is estimated to equal more than half of the area of the whole of the coal-fields of Great Britain and Ireland. Some of the coal-seams are of excellent quality, specially that known locally as "block-coal," which is said to be unrivalled for iron-furnaces. Abundant iron ore likewise occurs. Hence not only coal-pits but iron-works are springing up in rapidly increasing numbers. Not a little of this wonderful rapidity of growth is attributed by Prof. Cox, and no doubt justly, to the extended and more accurate knowledge of the minerals which the Survey has been able to publish. In the course of two or three years tracts of "primeval forest" have vanished, and in their place the visitor would now see clanking engines and mining villages, crowded with a population as busy and begrimed as any to be met with in Staffordshire or Lanarkshire. And yet vast though this change is, it may be said to have only just begun. Before many years are over the coal-bearing part of the formerly quiet agricultural state of Indiana will become one of the most active centres of industry in the Union, with railways diverging in all directions to carry away its mineral produce.

Prof. Cox and his assistants have not only been successful in pointing out the mineral resources of the various counties. In looking through his reports one can see that he continues from year to year to slip in more of general scientific interest. This is notably the case with the volume lately published. In addition to a series of

elaborate analyses of coals, we find that in the coal-pit sections the names of characteristic fossils have found their way into the text, that notices are given, not merely of the economically useful minerals, but of the geological formations which have no special industrial value,—Silurian, Drift, River-terraces, &c. The volume contains also meteorological tables and notices of recent geological changes. But by far the most interesting contribution to science in its pages is a "Report on the Wyandotte Cave and its Fauna," contributed by Prof. E. D. Cope, with an account of the geology of the cave, by Prof. Cox himself. This remarkable cavern runs through the "sub-carboniferous" limestone in numerous branches which are said to have a total length of twenty-two miles, and greatly to excel the more famous Mammoth cave of Kentucky in the number and beauty of their stalactites. It contains a peculiar fauna, numbering at least sixteen species, which show a general resemblance to those of the latter cave, and include one species of blind fish (*Amblyopsis spelæus*) which lives in the subterranean waters of Kentucky.

In these Reports each county is described separately, so that the same geological facts require to be frequently repeated. This is, doubtless, the most useful arrangement for those for whom the volumes are primarily intended. But it would be a service to other readers if a good table of contents were given, and if the index were made much fuller, especially in matters of general geological interest. The volumes are eminently praiseworthy, and we hope to see them followed, before long, by a good map and a general geological Report of the whole State of Indiana.

A. G.

INTELLECT OF PORPOISES

A SINGLE visit to the Brighton Aquarium would suffice to convince a recent correspondent, Mr. Mattieu Williams, that the intellect of the porpoise, as foreshadowed by its convoluted brain, exceeds, beyond comparison, that of the cod-fish or any other representatives of the piscine race. Of the two specimens now inhabiting the largest tank in the building, over one hundred feet long, the first-comer so readily accommodated itself to its altered conditions, that on the second day it took its food, smelts and sprats, from its keeper's hand; and has continued to do so ever since. The later arrival was, at first, less sociably inclined; but both have latterly become equally tame, and frequently, while receiving fish from my hand with the gentleness of pet dogs, have permitted me to pat and stroke their slippery india-rubber-like backs.

During feeding-time it is amusing to watch the avidity with which these porpoises take their food; one, the more active of the two, usually securing the lion's share, and displaying marked sagacity by frequently snatching a second or third morsel before disposing of the first.

The keeper in charge of these interesting animals is now in the habit of summoning them to their meals by the call of a whistle; his approaching footsteps, even, cause great excitement in their movements, and recent experiments have proved them to be acutely sensitive to the vibrations of sound. By the physiologist a more pleasing spectacle can scarcely be witnessed than the graceful actions of these cetacea, as they swiftly pursue their course up and down their spacious tank, ascending to the surface of the water at intervals of fifteen or twenty seconds, to breathe, each inspiration being accompanied by a spasmodic sob-like sound, produced by the rush of air as a breath is rapidly liberated and inspired through the single central blow-hole.

Onward progress is effected in these animals, as in all other cetacea, exclusively by the action of the horizontal caudal fin; the development of muscle at the "wrist" of the tail on which this action depends being enormous and

plainly visible externally; the pectorals are devoted principally to the purpose of steering the creature to the right or left, aiding it also in rising to the surface of the water.

The fact alone of the porpoise suckling and evincing much maternal solicitude for the welfare of its young indicates the superiority of its position in the zoological scale above that of the other representatives of the finny tribe; and to this, in addition to the remarks just made upon their sagacity when feeding, many other facts may be cited, pointing in the same direction. The curiosity attributed to these creatures, as illustrated by the experiences of Mr. Mattieu Williams, receives ample confirmation from their habits in confinement. A new arrival is at once subjected to the most importunate attention, and, advancing from familiarity to contempt, if disapproved of, soon becomes the object of attack and persecution. A few dog-fish, *Acanthias* and *Mustelus*, three or four feet long, placed in the same tank, soon fell victims to their tyranny, the porpoises seizing them by their tails, and swimming off with and shaking them in a manner scarcely conducive to their comfort or dignified appearance, reminding the spectator of a large dog worrying a rat. The fine sturgeon, six feet long, now sharing an adjoining tank with the cod, was first placed with these animals, but in a short time was so persecuted that for safety it had to be removed; while to this day the lacerated condition of its tail bears witness to the pertinacious attention of its former comrades. Some large skate (*Raja clavata* and *maculata*), while they maintained their usual habit of lying sluggishly on the floor of the tank, escaped molestation; but no sooner did these fish display any unwonted activity than the porpoises were upon them, and, making a convenient handle of their characteristic attenuated tails, worried them incessantly. On one occasion I witnessed the two *Cetacea* acting evidently in concert against one of these unwieldy fish, the latter swimming close to the top of the water, and seeking momentary respite from its relentless enemies, by lifting its unfortunate caudal appendage high above its surface. It need scarcely be remarked that the skate were removed before further mischief could be done, leaving the porpoises, with the exception of a few conger, which during the day-time mostly lie hidden in the crevices of the rock-work, turtles, and a huge monk-fish (*Rhina squatina*) sole occupants of this colossal tank.

While far behind the porpoises in display of intellect, it may be hereafter shown that the representatives of the *Gadidae*, or cod-family, are by no means the least intelligent of fish.

W. SAVILLE KENT

AN INTERNATIONAL COINAGE

A PROPOSITION has been made for holding a private conference for an International Coinage at Vienna in the course of next September, and to consider more particularly the following points:—

1. The question of Valuation.
2. The principal Coins.
3. The Unit of Value, and its Sub-divisions.
4. The charge for Coining, the rate of alloy, and other technical questions.
5. The preservation of the full value of the principal Coins in circulation, and the coining of others.
6. The different modes of introducing a new money-system.

The prime mover and most active agent in the promotion of this conference is Mr. A. Eggers, Consul in Bremen. The declared object is to bring together a limited number of semi-official or private representatives of the various countries, with a view of a full discussion of the subject; and a committee has been constituted consisting of several French and German gentlemen who are interested in the question of the International Coinage.