Saturn, -180° C.; Uranus, -207° C.; and Neptune, -221° C.

In the case of Saturn, the observations seem to indicate that the temperature is higher than can be maintained solely by the incident solar radiation. In other words, the interior of the ball of Saturn is still relatively hot. This is in agreement with the views expressed by Poynting twenty years ago, when he made his theoretical calculations of planetary temperatures, obtain-

ing 69° C. for Venus and -38° C. for Mars. As an average value for the whole disk of Mars, Poynting's calculation of -38° C. is in good agreement with our observed value of -30° C.

The observed temperature of the moon, 125° C., is in good agreement with the values assigned to it years ago by Lord Rosse, 110° C., and more recently by Very, 150° C., by comparison of the lunar radiation against a black body.

Deinosaur Eggs.

By Dr. F. A. BATHER, F.R.S.

THE *Times* published on September 9 an interesting despatch from its Peking correspondent, giving further details of the discoveries in Mongolia by the expedition from the American Museum of Natural History, led by Mr. Roy C. Andrews. The fresh information about the fossil eggs attributed to dinosaurs suggests some comment.

Two of the recent finds are particularly worthy of note. One is a nest of twelve eggs almost perfectly preserved. The eggs were arranged in a circle, with the narrow ends pointing outwards; no doubt the broad end was, as in birds, that which first emerged, but in birds' nests this end of the egg is, as one would expect, directed outwards. Then the eggs are said to have been "in two layers of six each," those of the upper layer presumably alternating with those of the under one. This, if a correct description, suggests that the dinosaur scooped a basin in the sand, and perhaps covered the first layer with sand, as is the habit of the Nile crocodile.

The other find was a nest of five eggs, "smaller than those found two years ago, more elongated, and evidently the produce of another type of dinosaur. The shells are smooth, in contrast to the dimpled surface of the others, and very thin." Are they the eggs of a dinosaur at all? All as yet known have notably thick shells. These might be the eggs of a crocodile or a chelonian. Turtles' eggs are now being fossilised in just the same way in the sand-dunes of Western Australia.

The last question will have to be settled by the study of thin sections. It is strange how little was known two years ago about the structure of egg-shells, whether recent or fossil, of birds or of reptiles. Nathusius alone has studied thin sections of recent egg-shells, describing that of the moa in 1870, and that of a python in 1883. About 1870 also, some Cretaceous fresh-water sandstones in Provence yielded the bones of a reptile and some fragments of egg-shell. The latter and thin sections cut from them were re-studied in 1922 by Dr. Van Straelen and Mr. E. Deneyer of Brussels. The reptile is generally supposed to be some sort of dinosaur, and the eggs are assigned to it with some probability, made stronger by Dr. Van Straelen's later researches, of which a preliminary account was recently issued by the American Museum of Natural History. The following summary is based on the researches quoted and a few more general facts.

The egg of all birds and reptiles, when first formed within the body, is covered with a flexible membrane. At a large number of points in this membrane minute specks of lime appear. Round each of these specks

more lime is gradually added in successive layers like the coats of an onion, thus building up little spheroids. When these spheroids meet one another, they form a complete coating to the egg, so that further layers of lime can be laid down only on the outer side of this. The layers outside any one spheroid thus build up a pile of irregularly prismatic shape and connect irregularly with the layers of the adjacent piles or prisms. On the inner surface of the first-formed coat each spheroid appears as a little hillock or mamilla; so this is called the "mamillar zone." The outer layers form the "prismatic zone." Outside the latter some of the membrane may remain as a "cuticle."

In chelonians the egg-shell is very thin, being composed only of the mamillar zone, with gaps remaining between the spheroids. In snakes the shell is still thin; the prisms are there, but they do not always join up. In crocodiles the shell is thicker than in turtles and in most birds, but the prismatic zone is scarcely developed; spaces, in the form of canals of two sizes, are left at intervals between the spheroids, so that air can reach the developing embryo. All birds have a mamillar zone and a relatively thick prismatic zone. In the *Ratitæ* the shell is thick and the air-canals branch as they near the outside, each ending in a group of pores. In the higher birds the shell is thinner and each canal opens in a single pore.

The dinosaur egg-shells already described by Dr. Van Straelen fall into three groups. In those associated with Protoceratops, from the base of the Upper Cretaceous, very small spheroids form a thin mamillar zone; the thick prismatic layer is traversed by relatively few air-canals, which end in minute pores and are of the same width throughout. In a Mongolian shell thought to belong to a duck-billed dinosaur the spheroids are larger, the pores a little larger, and the canals swell in the middle. In the shell from Provence the mamillar zone is much as in the last-mentioned; but above it are cavities which give rise to straight air-canals of equal bore, ending in pores of 0.1 mm. to 0.2 mm. diameter.

Thus the three types of supposed dinosaur eggs show a general agreement with one another. They differ from the eggs of all other creatures, but present certain resemblances to the eggs of crocodiles and birds, just as one would expect dinosaur eggs to do. We may therefore conclude that they really were laid by the dinosaurs the remains of which are found with them.

In addition to these three types, Dr. Van Straelen has in hand material from other parts of the world, including a probable dinosaur egg from the Oxford Clay of Peterborough and other eggs from the Oolite

of Great Britain. Now Mr. Roy Andrews tells us of one new type, of deinosaursian appearance, and another which is not so obviously deinosaursian.

The question whether all these eggs are those of deinosaurs has its converse: did all deinosaurs lay eggs? This cannot be taken for granted. The eggs of deinosaurs must have been hatched by the heat of the sun or of decaying vegetable matter, and it is natural to find them laid in rocks formed under desert conditions. To lay its eggs a deinosaurs must have

trod on *terra firma*. The huge sauropods that lived in the estuaries of Wyoming, Argentina, and Tanganyika can in many cases have climbed on to the land only with great difficulty, and it is even doubtful whether their limbs could have supported their enormous weight out of the water. It may therefore well be that, like the water-inhabiting ichthyosaurs and sea-snakes, these monsters were viviparous. The East African Expedition of the British Museum is not likely to find their eggs in Tanganyika Territory.

Current Topics and Events.

IN the course of an interesting account of the discovery in the Gobi Desert of forty more dinosaur eggs, representing three species, given to the correspondent of the *Times* at Pekin by Mr. Roy Chapman Andrews, the leader of the third expedition of the Natural History Museum of New York to Mongolia, which appeared in the issue of September 9, it is stated that implements of a type corresponding to the Azilian period of western Europe have been discovered by members of the expedition. These implements, made of red jasper, chalcedony, and chert, were found under the sand dunes which are characteristic of the district, and include such forms as spear- and arrow-heads, axes and knives, and so forth, of careful workmanship. Pieces of egg-shell of dinosaur and giant ostrich pierced with holes were evidently used for ornament. In a more recent deposit were two fossil skulls with other evidence of a later culture, which is stated to be "probably neolithic," although bronze points are mentioned as among the finds. Other relics of early man found in this area include a few implements of Mousterian type and pictographs illustrating moose, elk, and other extinct mammals of which the relation to the other finds is not specified.

It is obvious that this account of the discovery, apparently of primitive implements of human workmanship, must be received with all reserve until a further and more authoritative account is to hand; but it certainly holds out hopes of the fulfilment of the expectation that this expedition might well find traces of early man in Central Asia. The mention of implements of Mousterian type is of especial interest, coming as it does within a short time of the publication of the evidence for Mousterian man obtained by Fathelich and Teilhard de Chardin in Northern China and Mongolia, and the discovery of Mousterian implements associated with a skull of Neanderthal type in Palestine. It is stated that the earlier culture was separated from the later in stratification; but it is necessary that more should be known of the nature and character of the intervening deposits before it is possible to judge how far any wide separation in date is justified. The mention of bronze with the later culture may serve as a reminder that the contemporary use of metal and stone is of frequent occurrence. Stone implements from early sites in Mesopotamia have been known to be classified as Azilio-Tardenoisian until it was pointed out that their coexistence with copper had already been recorded. The geologists of the American expedition,

however, appear to be satisfied as to the antiquity of the early deposits, which they date at somewhere "between 10,000 and 20,000 years old." The further conclusion that primitive man came to Europe from Asia is here made to depend upon a dating of the Azilian culture in western Europe of 7000 years, which is quite possibly too low.

A PLASTER cast of the skull and jaws of *Protoceratops andrewsi* has been received from the American Museum of Natural History and placed on exhibition in the Fossil Reptile Gallery at the British Museum (Natural History). This is not the type, but one of the best skulls obtained in 1923, and is nearly full grown. It is 21 in. long, 16½ in. high, and 18½ in. wide. The skull was found in the Djadochta Sandstone, a desert formation at the base of the Upper Cretaceous in the Gobi desert. *Protoceratops* is supposed to be the deinosaurs that laid one kind of the famous eggs. It was herbivorous and one of the primitive Ceratopsia—a group of which *Triceratops* is the best-known example. It is not, however, regarded by the American palæontologists who have studied it as being in the direct line of ancestry of any of the American Upper Cretaceous genera, except perhaps *Leptoceratops*.

HOPES for the regeneration of China which were aroused by the prospect of liberating the funds accruing from the Boxer Indemnity seem likely to remain in abeyance for an indefinite period. The course of events at the moment is more than unfavourable to foreign intervention in domestic affairs, and in education, as in other matters, the Chinese, or at least the more aggressively demonstrative section of the population, do not hesitate to show their desire, and their confidence in their ability, to deal with the situation without outside assistance. In the meantime, the attitude of the students and the prominent part they are taking in the present disturbances lend support to the views of those with first-hand knowledge of the Chinese who are dubious of the advantages for China of an education on even partially Europeanised lines. It may be hoped, however, that this is but a passing phase which affects only the more restless and easily stirred section of the population. It must be remembered that in a country like China, in which, broadly speaking, scholarship has been the only passport to positions of authority, it was almost inevitable that the students would come to taking a hand in times of crisis, and equally inevitable that