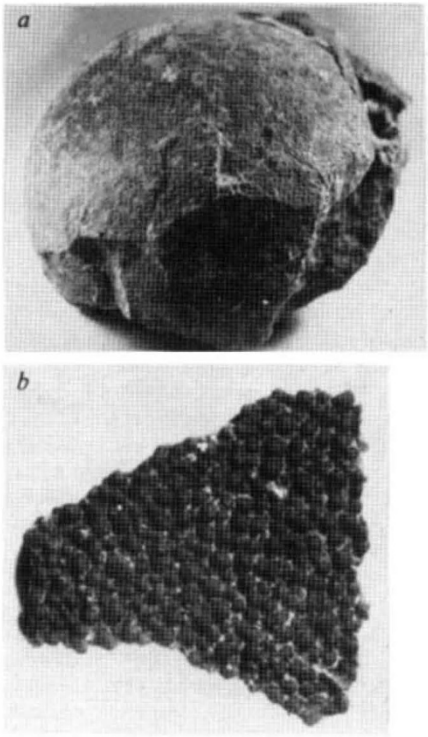
Dinosaur eggs from Romania

SIR—A recent rock fall at an outcrop of Late Cretaceous age (65 million years ago) in the northern part of the Haţeg Basin of Transylvania, Romania (4.5 km east of the town of Vălioara) has revealed the first dinosaur eggs to be found in Romania. Fourteen eggs, distorted to varying degrees, were discovered in a 0.5-m-thick layer of red, silty, clay that has since been found to contain fine volcanic ash and is sandwiched between iron-rich marls, with thin calcrete nodules and tubular burrows beneath. An erosional surface above the clay bed is topped by a thick bed of conglomerate of epi- and volcaniclastic elements in a tufitic matrix.



a, A well-preserved egg attributed to "*Magyarosaurus*" collected from the locality near Vălioara (0.23 × natural size). *b*, External surface of the eggshell at low magnification to show the tuberculated surface (× 1.58).

The eggs are sub-spherical in shape and were found lying clustered in four linear rows, each comprising either two or four eggs. The distance between two clutches containing respectively two and four eggs was 0.5 m. Eight eggs are well preserved, with their lower surfaces almost complete, but the upper surfaces cracked and eroded (see figure). Shell fragments from the upper surface were found in the sediment surrounding the eggs. No skeletal remains were found.

The thickness of the eggshell varies between 2.3 and 2.4 mm. The external surface is irregularly tuberculated (*b* in the figure) and air canals between the tubercles are filled with calcite. The tubercles mark the external ends of densely packed and wedge-shaped, prismatic crystalline units that do not interlock laterally. Under high magnification they can be seen to be made of fine laminae which lie parallel to the external surface of the shell. These structures correspond closely with those described as tubocanaliculate[1,2]. In vertical section the internal surface of the shell is irregular, following the bases of the crystalline units.

The identity of the animals that laid these eggs, as well as eggs of similar age from southern France, is the subject of debate[1,2]: the Haţeg fauna includes ornithopod, ankylosaurian, theropod and sauropod dinosaurs, pterosaurs, crocodiles, turtles, birds and primitive mammals (multituberculates)[3,4]. The large diameter of the eggs (150 mm) excludes as potential layers all except the larger known elements of the fauna: "*Titanosaurus*" (=*Magyarosaurus*) (a sauropod), *Telmatosaurus* (a hadrosaur), and a newly discovered large theropod (D.B.N., D.B.W. and D.G., manuscript in preparation).

It has been proposed[1,2,5] that tubocanaliculate-type dinosaur eggshells were laid by sauropods: on this basis we conclude that these eggs were probably laid by a sauropod dinosaur, and should be referred to provisionally as *Magyarosaurus* eggs.

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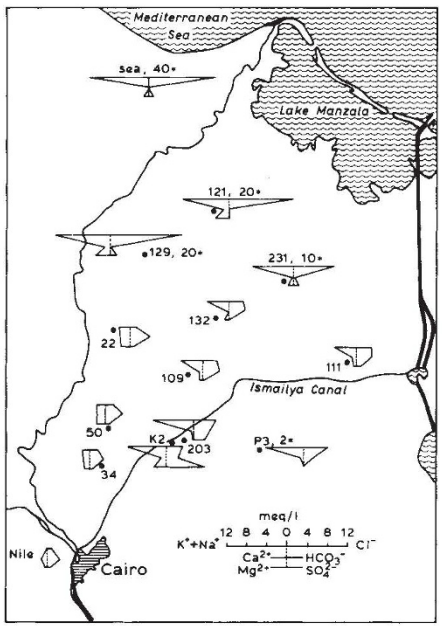
Ground water in the Nile delta

SIR—Burns *et al.*[1] suggest that increases relative to Nile water of the concentrations of sodium and potassium in ground water under Karnak (upper Egypt) may be caused by evaporation, and that the evaporation percentage is 89%, which they consider rather high. The calculation of evapotranspiration from concentration increases in ground water with respect to source water, is an old and simple technique[2,3] that works well when the amounts of the ions are strictly conserved and their sources are known with confidence.

Anions such as chloride are often well conserved because, in many ground waters the only source of chloride is atmospheric deposition; chemical processes do not significantly affect concentration. But cations such as sodium and potassium are typically not conserved, because they are involved in biological cycles, are set free in weathering reactions of feldspars or participate in cation-exchange reactions. The large increase of sodium and potassium reported in ref. 1 could be caused by dissolution of Na-minerals from the soil in combination with cation-exchange.

Fresh ground water in the Nile delta originates almost exclusively from Nile water. Ground water along the Ismailia Canal, which carries water from Cairo to the eastern part of the delta, shows an increase of chloride-ion concentration with respect to Nile water undoubtedly caused by evapotranspiration. At the same time, the ratios of the main cations change, as shown in the Stiff diagrams (see figure). The cations calcium and magnesium show a relative decrease, and sodium and potassium show a relative increase with respect to chloride. The decrease of calcium and concomitant increase of sodium could well be a result of dissolution of sodium minerals such as trona, and



Groundwater compsitions in the Nile delta, Egypt, indicating saltwater upconing in boreholes 121 and 129, and Ca/Na-exchange near the Ismailia canal. Groundwater samples from the archives of the Groundwater Research Institute, Cairo.