FIG. 2 Head of *Oviraptor*, showing the projecting cassock, beak and two peg-like projections in the centre of the palate; skull length is about 20 cm. Reconstruction by Greg Paul.

History. This last project has been exceptionally successful, particularly at Ukhaa Tolgod in south-central Gobi, where new kinds of dinosaurs and spectacular preservation — including eggs containing embryos — have been found[4–6].

Among the most abundantly preserved dinosaurs at Ukhaa Tolgod are oviraptorids. These are members of Theropoda (Fig. 1), a group that also includes *Tyrannosaurus* and *Allosaurus*. With a wildly projecting cassock perched atop a short, deep skull, long arms with three-fingered hands, each finger opposable and sharply taloned, and long, muscular, presumably fast-running hind legs, *Oviraptor* and its close relatives have the gestalt of a horrible nightmare. In this case, however, looks deceive. The front of the skull of these two-metre-long dinosaurs was formed into a toothless beak, the bones of the skull roof and the braincase contained a complex pattern of air sinuses, and paired peg-like projections occupied the midline of the palate (Fig. 2). What these unusual theropods ate is still not precisely known[7].

As described by Norell *et al.*, the extraordinary preservation of the Ukhaa Tolgod *Oviraptor* owes a great deal to rapid death and burial in what must have been a powerful sandstorm, so sudden that we are left with the impression of an animal freeze-framed in the act of nest brooding. The specimen is largely complete, missing only the skull, parts of the hindlimb and the vertebral column. The arms are held back and somewhat laterally as if protecting the periphery of the nest. The belly, as indicated by the paired pubic bones, is positioned directly over the nest, while the hind legs are tightly folded, suggesting that brooding consisted in squatting above the eggs.

Beneath the *Oviraptor* skeleton are 15 eggs laid in a circular pattern; Norell *et al.* calculate that the nest may have originally contained as many as 22. Egg shape and eggshell architecture are fully consistent with eggs referred to *Oviraptor* known from other material, although there is no evidence of colonial nesting as suggested for several other kinds of dinosaur. It is not yet known whether any of these eggs contain embryonic material.

Astonishing as this new *Oviraptor* specimen is in its own right, its ultimate importance will emerge from the kinds of questions it solves and, more so, from those that it raises. For example, it extends the distribution of avian-style nest brooding down the evolutionary tree into the realm of non-avian dinosaurs for the first time. Furthermore, it opens up a wealth of research avenues on dinosaurian life histories, which are particularly poorly known among non-avian theropods. What is the relationship between egg size, clutch size and adult size at reproductive maturity in this and other dinosaurs? What is the behavioural and ecophysiological significance of positioning eggs in a circular pattern?

Combining information from this new specimen with that from the newly discovered embryonic and existing subadult and adult *Oviraptor* material, we can also investigate the morphometric changes with growth in this species and compare them with those in other theropods. Likewise, possible differences between the bones, joints and tissues of embryos, young and adults become open to study. The answers to these kinds of questions, when put into their evolutionary context[8], should provide the basis for translating the reproductive biology, growth and development of individual dinosaurs into the stuff of evolutionary dynamics in this important group of Mesozoic tetrapods. □

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1. Carpenter, K., Hirsch, K. F. & Horner, J. R. (eds) *Dinosaur Eggs and Babies* (Cambridge Univ. Press, New York, 1994).
2. Norell, M. A., Clark, J. M., Chiappe, L. M. & Dashzeveg, D. *Nature* **378**, 774–776 (1995).
3. Lavas, J. R. *Dragons from the Dunes* (J. Lavas, Panmure, Auckland, 1993).
4. Novacek, M. J., Norell, M. A., McKenna, M. C. & Clark, J. M. *Scient. Am.* **271**, 60–69 (1994).
5. Norell, M. A. *et al. Science* **266**, 779–782 (1994).
6. Dashzeveg, D. *et al. Nature* **374**, 446–449 (1995).
7. Barsbold, R., Maryańska, T. & Osmólska, H. in *The Dinosauria* (eds Weishampel, D. B., Dodson, P. & Osmólska, H.) 249–258 (Univ. California Press, Berkeley, 1990).
8. Weishampel, D. B. & Horner, J. R. in *Dinosaur Eggs and Babies* (eds Carpenter, K., Hirsch, K. F. & Horner, J. R.) 229–243 (Cambridge Univ. Press, New York, 1994).

DAEDALUS

Blood and iron

ALL iron rusts in the end. Even the finest paints and platings merely postpone the evil day. Some simply cheat — a crafty marine paint turns rust white to make it less obvious. Now Daedalus is fighting back. Just as iron rusts spontaneously in a wet oxidizing environment, he says, so there should be some reducing environment in which rust reverts spontaneously to iron.

Such an antirusting reaction would probably be as mild, slow and relentless as rusting itself. Daedalus reckons it could be incorporated into paint. An antirusting paint would not merely act as a barrier to water and oxygen, or react with them pre-emptively to guard the metal beneath; it would actively reverse rusting as fast as it happened.

One obvious rust reducer is carbon monoxide. It is the active reagent of the blast furnace; at red heat it rapidly reduces iron ore (which is merely geological rust). Even at room temperature it has an intimate iron chemistry. This is why it is poisonous — it combines with the iron in haemoglobin, giving a bright red complex. DREADCO's chemists have invented a paint loaded with haemoglobin. Exposed to carbon monoxide, it absorbs the gas and flushes a lurid cherry red. The chemists are spraying it experimentally onto steel sheets, and leaving them out to rust. With luck, the carbon monoxide in the paint will reverse the rusting as fast as it occurs. When it is all used up, the paint will turn the purplish colour of venous blood. The sheets will then be put back into carbon monoxide, when the paint will recover its vivid colour and protective action.

Haemoglobin releases its carbon monoxide in bright light, disengaging the molecule in a somewhat energetic state. With a little chemical tweaking, the complex may be persuaded to trap the energy of daylight quite efficiently, and use it for very powerful rust reduction. The final product, DREADCO's 'Reverse Rust' paint, will be snapped up by engineers and householders alike. It can be painted straight onto rusty surfaces; it will last for ages; and when it finally gets exhausted it will change colour in the very places that need reactivation. You won't even have to scrape it off and repaint the surface: just smear or spray on a rejuvenator loaded with carbon monoxide in dissolved or complexed form. Objects up to about the size of a car (say) could be restored most easily by placing them in carbon monoxide gas. Those who commit suicide by running their car engine in a closed garage would journey to the next world in a bright and rustless vehicle.

David Jones