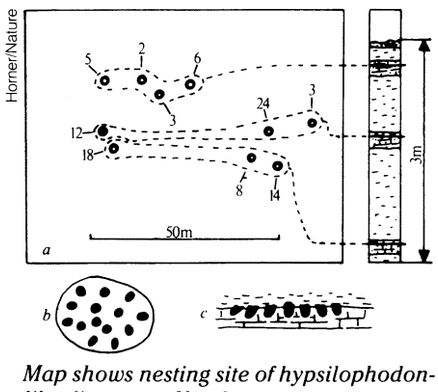
Dinosaurs: Colonies and the prey next door

When paleontologists envision the social orders of the dinosaurs, their speculations often are scrambled by rubble of broken eggshells and the dearth of nests and skeletons of baby dinosaurs. Slowly, though, a picture is emerging. Recent discoveries in Montana indicate that some dinosaurs nested in colonies and that adults of at least one species used the same nesting site repeatedly.

"I'm quite certain that there were as many different kinds of behavior among the dinosaurs as there are among different species of birds," says John R. Horner of the Museum of the Rockies at Montana State University. He reports his findings in the June 24 NATURE.

The nests and skeletons of juveniles are about 75 million years old. They were found in the Two Medicine Formation in sediments of the same age, or horizon, as those that in 1978 provided the first evidence of extended parental care among dinosaurs, specifically the plant-eating, duckbill dinosaurs called hadrosaurs *(Maiasaura)*. The article cites eight nests about seven meters apart — the length of an adult hadrosaur. The abundance of nests for animals of the same species suggests that the hadrosaurs lived in a colony. The group arrangement would have obvious advantages. For instance, the presence of so many adults may have discouraged potential predators. Parental supervision and prolonged stay of the young in their nests and nesting area also may have encouraged the babies to grow rapidly.

Horner suggests that rapid growth would support the idea that some dinosaurs were warm-blooded. "If the duckbill dinosaurs we find in nests grew as fast as the fastest-growing cold-blooded animal, the crocodile, then they would have been about a year and a half old [by the time they left the nest]. There aren't any animals that take care of their young in a nest for that long," he says. "If they were warm-blooded and grew at a rate equal to a ground-nesting bird such as an ostrich, then they would have been a month or two old, which is certainly more reasonable." The duckbill dinosaurs found in nests range from a third of a meter to about a meter long.



Map shows nesting site of hypsilophodon-like dinosaurs. Numbers represent eggs per nest; broken lines show clutches found on single sedimentary horizons. Below: egg layout.

Another nesting site in the same location has yielded several partial skeletons of a yet-unidentified dinosaur much like the hypsilophodon. Hypsilophodons were more primitive than hadrosaurs though they belong to the same order, the Ornithischia, or bird-hipped dinosaurs. Remains of egg clutches show that the babies left the nests soon after hatching but, like penguins, may have been gathered into bird-like crèches. Their nests have been found so far at three horizons, a clue that the animals returned to the site year after year.

Fossils of the hypsilophodon-like dinosaurs may separate them from the rest of known ornithischians, all of which were herbivores. Teeth from these animals are more like those of omnivores and carnivores. Their prey, Horner says, may have been the young hadrosaurs next door.

—C. Simon

Asbestos: Some new grounds for concern

Asbestos flooring—the third largest use for asbestos, both in the United States and in Europe — is capable during ordinary wear of emitting airborne asbestos fibers in "important" concentrations, according to a team of French researchers. "Up to now," report the authors of this study in the June 25 SCIENCE, "the presence of asbestos flooring within a building has not been considered a serious source of potential airborne asbestos."

Ironically, the report appeared on the eve of the June 28 implementation date for the Environmental Protection Agency's first asbestos regulations. And those regulations—first proposed in September 1980 (SN: 10/4/80, p. 215) — are as notable for what they don't regulate as they are for what they do.

First, what they do: The EPA rules require the nation's public and private elementary and secondary schools to inspect their premises for the existence of asbestos-containing friable building materials, especially ceiling tiles and thermal or acoustical insulation. (Friable materials can crumble when dry or be reduced to a powder by hard pressure.) All findings must be formally recorded. When materials containing asbestos are found, the schools must notify parent-teacher associations of their findings, notify employees of the findings and provide employees with instructions on ways to reduce asbestos exposure. Any school that has already complied with the inspection and notification aspects of the rule through previous actions — and an estimated 47,000 of the nation's roughly 91,000 primary and secondary schools have done so — need only certify their results and maintain records.

Now for what the rules do not do: They do not require that a school take any corrective action to eliminate or securely encapsulate (SN: 6/20/81, p. 390) the source of potentially dangerous asbestos fibers. They do not even explain how much asbestos — in place or in the air — might be expected to constitute a health hazard justifying corrective action. (Not only is asbestos a known human carcinogen, but it has also been linked with other serious, irreversible and often fatal diseases.) Though building materials account for most of the asbestos used each year in the United States (statistics in the June 17 NEW ENGLAND JOURNAL OF MEDICINE note that in 1978, at least 79 percent of U.S. asbestos consumption went for building materials), only schools are covered by the regulations. Finally, the rules apply only to friable building materials containing asbestos. Floor tiles are not friable and are therefore exempt from EPA's rule.

The French researchers, led by P. Sebastien of the Laboratoire d'Etude des Particules Inhalées in Paris, were also set to ignore the possible contribution of floor tiles as a source of asbestos pollution when they surveyed a 10-year-old office building outside Paris. Ostensibly they had been called in to measure the asbestos-fiber fallout from ceilings that had been sprayed with asbestos. But they became suspicious when much of the asbestos they measured in the air was of a mineral type — chrysotile — not found in the ceiling material (its asbestos was almost pure crocidolite). Directing suspicion toward the floor tiles were data showing that highest activity areas registered the highest chrysotile levels.

At each of the four sampling sites, chrysotile levels were notably higher than crocidolite concentrations. Actual chrysotile readings were 8 nanograms per cubic meter of air, 21 ng/m^3, 25 ng/m^3 and 170 ng/m^3. Using an EPA conversion factor, that translates into readings of 240, 630, 750 and 5,100 fibers per m^3 of air — well within the federally regulated levels permitted in U.S. industry of 2 million fibers per m^3 of air.

The French researchers note that despite a 1976 estimate that asbestos flooring could increase airborne asbestos levels on average by as much as 80 ng/m^3, most organizations, including EPA, ignored flooring. EPA spokesman Joe Handy confirmed that his agency had been "pretty much of the opinion that there were no problems from [asbestos floor] tiles." As a result of the new report in SCIENCE, however, he says EPA is reevaluating its stance. He adds, however, that even if EPA chooses to one day include flooring in its rules, new regulations are at best years away.

—J. Raloff