

and storage of tuna in lead-soldered cans elevates lead 1,000 fold over levels present in the fish when they are caught, 50 fold over tuna packaged in cans without lead-soldered seams.

"The Food and Drug Administration lacks the ability to properly measure lead in human environments," Patterson charged in an interview with *SCIENCE NEWS*. The agency has confused levels of lead present in fresh tuna samples that have been measured over the years for background levels naturally present in the fish, Patterson says. But the levels measured, he claims, represent not only the background levels but also pollution introduced during the collection and laboratory preparation of specimens. Such contamination is not only common but the rule, he contends, citing one government laboratory under contract to FDA that he says erred by a factor of 1,000 too high. If the analysis it made is accurate, Patterson says, it is only because the laboratory inadvertently contaminated the sample by that factor.

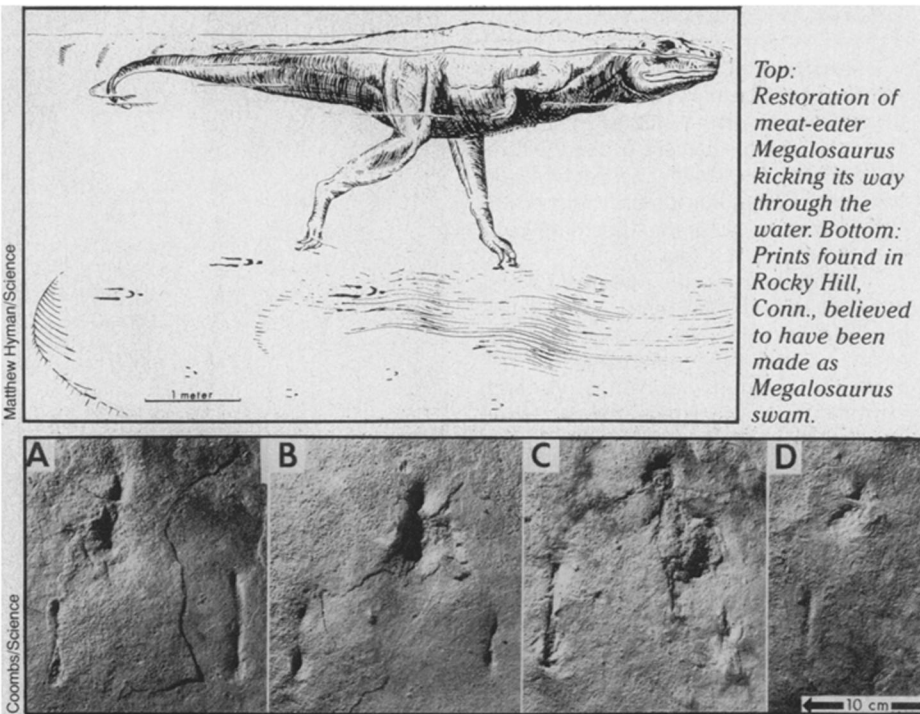
"With techniques available in only five or six labs on earth, [Patterson] has measured levels of lead that are much lower than anyone else has ever found. On the basis that Patterson's analysis has been compared with other people's, I think he's got a good case that he's right and they're wrong," says Edward Groth, the senior staff officer in charge of a report entitled "Lead in the Human Environment," to be published this spring by the National Research Council of the National Academy of Sciences. Patterson was a major contributor to that report.

The problem with erring on the high side in the studies of fresh tuna is that it lulls federal agencies into thinking that the difference in lead concentrations between supposedly "clean" starting samples and contaminated samples is only a factor of four or five, Patterson asserts, when the actual difference is really more like a factor of 1,000.

On Aug. 31, 1979, FDA published a notice in the *FEDERAL REGISTER* stating the agency's intent to set standards for lead levels in food. Currently, FDA's only lead standards for food involve baby food and evaporated milk. FDA has requested the canning and food industry to document current lead levels in their products and to project how low lead levels can be lowered. Patterson, charging that these studies are based on inaccurate measurements, complains that they are unsuitable for use in developing standards. But Paul Corneliusen, director of FDA's analytical chemistry and physics branch, says, "We don't have a lot of corroborating data to support the fact that Patterson's lab and a few others might be uniquely qualified" to do lead assays.

And that's not likely to change, Groth says, because of the expense — in both time and money — required for the meticulous assays reported by Caltech. □

## Carnivorous dinosaurs in the swim



Top: Restoration of meat-eater *Megalosaurus* kicking its way through the water. Bottom: Prints found in Rocky Hill, Conn., believed to have been made as *Megalosaurus* swam.

The huge meat-eating dinosaur may have been chasing lunch as it dove into the lake that day 180 million years ago. It could have been eluding another rapacious reptile. Or it might just have been going for a dip. Whatever its purpose, it moved easily through the 8-foot-deep water, kicking off the bottom with the claws of its strong hind legs and leaving evenly placed scratches in the thick mud. Eons later, when state geologist Richard L. Krueger showed W.P. Coombs those scratches preserved in the stones of Rocky Hill, Conn., the thought "immediately struck [Coombs]" that the animal had been swimming. "The only way I could visualize those tracks being made was by an animal whose weight was buoyed."

The unusual tracks — a triangular arrangement of two parallel scratches and a semicircular imprint — are the first evidence that carnivorous dinosaurs were able to swim, Coombs reports in the March 14 *SCIENCE*. Common thinking, says Coombs, has been that vegetarian dinosaurs avoided their predators via water, implying that meat-eaters were not so aquatically adept. The footprints belie this supposition and "raise the possibility that they could have swum out after herbivorous dinosaurs in the water in the same way that some cats chase their prey into water today," Coombs said in an interview from Western New England College in Springfield, Mass.

The swimmers left at least 43 prints that fall into two size categories. Several of the tracks form sequences clearly made by single individuals. Based on the stride length, the spacing of the claw marks, the sharpness of the claws that made the marks and the types of dinosaurs previ-

ously determined to have lived in the area, Coombs concludes that carnivorous rather than herbivorous dinosaurs were responsible for the tracks. The large tracks are most likely the work of either *Megalosaurus* or *Teratosaurus*, he says, while the smaller tracks best fit a small carnivore from the family *Coeluridae*.

The tracks are not likely to have been made by other means of movement, says Coombs, because dinosaurs used the entire foot in both running and walking. Similar tracks have been reported only one other time, he says — to be expected since currents would quickly wipe them out. In this case, the lack of current in the lake and the stickiness of the thick mud prevented the tracks from being washed away. As the dinosaur's foot touched bottom, the claws sank deeply into the bottom. When the animal pushed off, the middle digit acted as a pivot and the other two claws shoved against the mud, leaving small grooves.

Coombs notes that while moving through the water by kicking off the bottom is not strictly swimming, the animal was certainly afloat and would have had to swim when its feet no longer reached the lake bottom. As for what the animals were doing in the water, Coombs declines to extrapolate from footprints to habits, but points out that two types of carnivorous dinosaurs are represented by the swimming tracks and suggests that "the ability to swim was common rather than exceptional among [carnivorous dinosaurs]. If this interpretation is correct, traditional hypotheses of escape behavior by herbivorous dinosaurs as well as of pursuit tactics of predatory [dinosaurs] will have to be revised." □