LETTERS TO THE EDITOR

Aquatic Dinosaurs

To the Editor:

I read Brian J. Ford's "Critical Focus: Aquatic Dinosaurs Under the Lens" (*The Microscope* 60:3, pp. 123–131, 2012) with great interest. It is always useful when someone from one field of science takes a look at another area. The idea that large dinosaurs were aquatic, popular in the first half of the last century, was replaced 40 years ago by the idea that they were almost exclusively terrestrial. Films like Jurassic Park (with its Cretaceous dinosaurs) showed large dinosaurs galloping across savanna landscapes and captured our imagination.

I started my career as a micropaleontologist, studying fossils of ultra-small oceanic plankton, but over the last 30 years I have concentrated on trying to understand conditions on a warm Earth, particularly the Cretaceous.

Ford's ideas need to be explored, because if many dinosaurs were lake or swamp dwellers, it means that we have left out a very important aspect of the boundary conditions for our numerical climate models — water on land. Our models have assumed dry land with the major atmospheric water source there being evapotranspiration. If there were extensive wet surface areas on the continents hosting dinosaurs this might well explain some vexing problems in model data comparisons.

WILLIAM W. HAY
Professor Emeritus, Department of Geological Sciences,
University of Colorado at Boulder

To the Editor:

Brian J. Ford's article, "Critical Focus: Aquatic Dinosaurs Under the Lens" (*The Microscope* 60:3, pp. 123–131, 2012) not only presents evidence that is highly selective or incorrect, but it ignores much of the research that has been done over the past 40 years on the biology of dinosaurs.

I was far from pleased to read the glib and inaccurate dismissal of the image of the floating *Brachiosaurus* from my 2004 paper published in *Biology Letters*. It is not, as described in the caption, a "rough diagram," but a carefully calculated result derived from the basic physics of buoyancy. The method used to locate centers of mass and buoyancy in dinosaurs has been tested on models of extant crocodilians, sea turtles, elephants and horses, and the results match what can be seen in the living forms when they are immersed in water. In keeping with his careful avoidance of conflicting evidence, Ford did not show the results for the alligator model nor the elephant model that are included in the 2004 paper. These results, and similar results for extinct forms, have been published in peer-reviewed mainstream journals that are reviewed by professional paleontologists and zoologists.

Ford's article is full of unsupported assertions and errors of interpretation, but I will only highlight one. The most laughable claim is that the set of elongate neural spines forming a "sail" on the back of *Spinosaurus* are the equivalent of a dorsal fin and a clear signal of an aquatic mode of life. Genuine, secondarily aquatic tetrapods such as living whales (both toothed and baleen) or the extinct *Ichthyosaurus* that possess a dorsal fin also have a suite of additional characters to complement the function of the dorsal fin. These include a caudal fin for axial propulsion; hydrodynamic fins/flippers for attitude and roll control; a smooth, fusiform body to minimize drag; and a vertebral column flexible enough to permit lateral or dorso-ventral undulations of the body for propulsion. Spinosaurid dinosaurs have none of these associated features to go with their "dorsal fin." They would not function very well as aquatic animals, if at all.

There is no way Ford's article was peer reviewed by professional paleontologists or zoologists. The fact

that a highly speculative and inaccurate article on dinosaurian palaeobiology had to be "hidden" in a journal that is not commonly read by paleontologists is very telling. It is a cowardly way of getting into print.

DONALD M. HENDERSON
Curator of Dinosaurs, Royal Tyrrell Museum of Palaeontology
Drumheller, Alberta, Canada

Brian J. Ford replies:

Dr. Henderson's splendid letter fits well with the innumerable others that have been circulating — indeed, not a single paleontologist around the world has done anything but complain bitterly about my views. This is a textbook example of how a radical departure from convention is received by orthodox academics within a discipline. The major journals (including those of the Royal Society, to which Dr. Henderson and I have both contributed in the past) refuse even to consider my papers — hence its appearance in my regular column for *The Microscope*.

However, my theories are based on evidence; other scientists from fields associated with paleontology are now beginning to concur with my views. I find myself in the embarrassing position of standing as an individual against an entire scientific discipline. Yet — as I suspect even Dr. Henderson feels — my theory is the correct one, and it cannot be long before the tide turns against the unrealistic notion of the essentially terrestrial dinosaur.

Giant dinosaurs evolved under the constraints of an aquatic environment.

The Microscope welcomes letters to the Editor. Please e-mail us at themicroscope@mcri.org, or write to *The Microscope*, 2820 S. Michigan Avenue, Chicago, IL 60616-3230. Include your full name, title and affiliation (if applicable), and location.