JAOA EDITORIAL

The anatomy professor that ate New York: Some dinosaurs are teachers, and some teach about dinosaurs

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As a clinical aphasiologist and, perhaps more importantly, as the father of Michelle S. Cammarata, DO, I took more than a passing interest in the qualifications and backgrounds of the faculty when my daughter started medical school at New York College of Osteopathic Medicine (NYCOM) of the New York Institute of Technology in Old Westbury, NY.

I had expected that the faculty directory of NYCOM would be replete with MDs and DOs, anatomists, and human biologists, with perhaps a PharmD thrown in here and there.

To my surprise, I discovered that the first course my daughter would take would be in anatomy and would be taught by one W. Desmond Maxwell, PhD—a paleontologist and, it turns out, the only paleontologist in the nation who also teaches gross anatomy, human histology, and neuroscience.

Now, I had never met a paleontologist, but I know what they are and what they do. And, in my mind, they all look the same: a slouchy hat, a pair of surveyor's boots, a pistol within easy reach, chiseled features, and wind-bitten cheeks. You know . . . Roy Chapman Andrews, fighting sandstorms and snakes as he prowled the Gobi Desert for prehistoric bones, providing the raw material for the Saturday matinee serials that would later inspire the *Indiana Jones* trilogy and *The Adventures of Young Indiana Jones*.

Well, I thought, I'd better keep my mouth shut about my surprise that such a fellow was not digging among rocks but among neurons, or I'll sound like a rube trespassing in the groves of academe.

So, when my daughter invited Dr Maxwell to our home for an Italian meal of sausage and pasta, I casually asked, "Say, Des, what's your clinical background?"

"Oh," he said, "I dig for dinosaurs."

As it turned out, Maxwell really *is* like Andrews or Jones—or pretty nearly. He hunts for dinosaurs in Montana, though, not Mongolia.

So why was this fellow teaching human anatomy to future physicians? This wasn't veterinary school after all, and even a DVM wouldn't be called upon to set the broken femur of an *Allosaurus fragilis* or a *Triceratops horridus*.

Being stuck on research, I too soon afterward did a little "digging" and found that this type of transdisciplinary approach is remarkably common—and has been for quite a long time. Of the approximately 1700 professors of anatomy in American medical schools, less than one tenth hold a medical degree. Many of the rest have spent much of their careers examining rocks that have nothing to do with gallstones.

I was shocked to discover for instance that Paul C. Sereno, PhD, the paleontologist who discovered one of the oldest dinosaurs now known, *Eoraptor* ("dawn raptor"), in the Andes mountains of Argentina, and a huge 36-foot-long sail-backed crocodile-type dinosaur in the Sahara Desert of the Niger Republic, *Suchomimus tenerensis*, is a professor in the department of organismal biology and anatomy at the University of Chicago's Pritzker School of Medicine.

Paleontologists were not the only surprises I found in my own "dig." More and more anthropologists—particularly biological anthropologists—are joining the faculties of medical schools. What was once a specialty that studied mainly cultural habits has expanded to include surveys of adaptive genetics, public health issues, and has even spawned the science of forensic anthropology.

Then I spotted an article recently published in *The Journal of the American Medical Association*. In it, Charles Wardell Stiles, PhD (*not* MD—and a zoologist to boot), argues that zoology—and, incidentally, chemistry and botany—ought to be part of the standard medical school curriculum. I should say that Stiles *had* argued that: the article was reprinted from 1901—around the same time that a geologist named Walter Scott Adkins, BS (who, together with Frank E. Lozo, figured out a way to solve geological enigmas through biostratigraphy), was beginning a varied career that included teaching anatomy among other subjects from 1913 to 1919 and then moving between and the private and public sectors until he joined the Shell Development Company in 1934 where he remained until his retirement in 1951.

"In order to get to the point where you can collect dinosaurs, do research on them, and teach human anatomy in a medical school, you need to be familiar with a lot of comparative anatomy, in addition to human anatomy," Maxwell told me. "Being able to stand over a cadaver and explain to stu-

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dents how various skeletal elements have changed from amphibians to reptiles to mammals to humans—or how the course of cranial nerves can be traced in a preserved dinosaur braincase and compared with those of humans, or how a *Sauropod's* trachea and esophagus may have exceeded 30 feet in length—enhances the teaching process. For sure, not every student is interested, but many welcome the additional information and begin asking questions.

"I remember explaining vertebral structure to a number of students in my office using a dorsal vertebra from a specimen of *Tenontosaurus ostrom*. The dinosaur's vertebrae are significantly larger than any human vertebrae, so it made viewing and appreciation of its description a little easier. I remember explaining the structure of the neural arch (the pedicles and laminae) and explaining that a lack of fusion of the laminae leads to spina bifida occulta, with other developmental problems possible. Of course, the students immediately wanted to know what the other developmental problems were (spina bifida cystica, spinal meningocele, and myelomeningocele), and if they occurred in dinosaurs. Answer: No one knows. But the net effect was that the students had an extra spark to help them remember and appreciate an anatomical abnormality in humans.

"Another dino-centered discussion involved aortic aneurysm. Dissection of the thorax would involve discussions of the lungs, heart, esophagus, trachea, and major blood vessels. One of these, the aorta, is susceptible to a weakening of its wall in various regions, leading to expansion and possible rupture. To emphasize that some of the weakening could be the result of hypertension, or blood exploiting a weakness that resulted from disease, I would ask students to imagine the force of arterial blood pressure emerging from the heart of a 60-foot-long dinosaur: 'Imagine the pressure involved with an enormous heart—with incredibly thick, muscular walls—contracting to force blood through a relatively narrow vessel. Now apply the same thinking to humans, but on a smaller scale.' Once again the question would pop up, 'Did dinosaurs suffer aneurysms?' We have no way of knowing, but that wasn't the point."

If nothing else, the aeonic perspective paleontologists like Maxwell bring to medicine forces these budding "gods in white coats" to stand in humility before Nature.

"The major point that I would try to get across is that *Homo sapiens* is *one* version of a body plan, and it certainly *does not* represent the pinnacle of evolution," Maxwell said. "We are just as susceptible to disease and physical breakdown as other organisms. This would lead to examples related to the various structures we were dissecting and discussing that day. Using evolution to provide a background to the development of the human body captivated a number of students, retained their interest in the class, and gave them a broader perspective, allowing them to place various anatomical structures—and the diseases or physical changes that affect them—in an evolutionary context."

We humans have yet to encounter anything as complex as our own bodies, any marvel of nature quite so astounding as our own flesh and blood. There is not only room for paleontologists, zoologists, anthropologists, and other specialists to make a contribution to the complex study of the human being, but their contributions are *necessary* to keep the practice of medicine from becoming too narrow, too blinkered, or, indeed, too proud. We should encourage the faculties of our medical schools to grow in diversity because instructional diversity yields extraordinary physicians.

Neither I nor my daughter will view the *Tyrannosaurus rex* at New York City's American Museum of Natural History again without a feeling of kinship, thanks to Maxwell. And, I daresay that neither of us will feel a twitch in our joints without wondering whether—a geologic epoch or two from now—Buck Rogers' daughter will be entering medical school and learning her gross anatomy from a bit of fossilized *Me*.

After all, we will, each of us, one day go the way of the dinosaurs. And, perhaps, if we are lucky, we will make a contribution to the education of future healers as they have.

And that's a lesson well worth the price.

Bibliography

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Editor's note

Currently, Dr Maxwell is an associate professor in the department of biological sciences at the University of the Pacific in Stockton, Calif. He is also a research associate at the following institutions: the University of California Museum of Paleontology in Berkeley, the University of Oklahoma's Sam Noble Oklahoma Museum of Natural History in Norman, and Montana State University's Museum of the Rockies in Bozeman.