

The Prehistoric Times Interview:

Gregory S. Paul

By Vince J.J. Curley

Vince Curley: Your book, *Predatory Dinosaurs of the World* is one of the greatest dinosaur books ever written. I've been told it's no longer in print, which I feel is a great injustice. Is this true, and if so, is there any possibility of another edition coming out again?

Gregory S. Paul: Just *one* of the greatest dinosaur books ever written? But seriously, the book is too out of date to be in print. And, someday. . . .

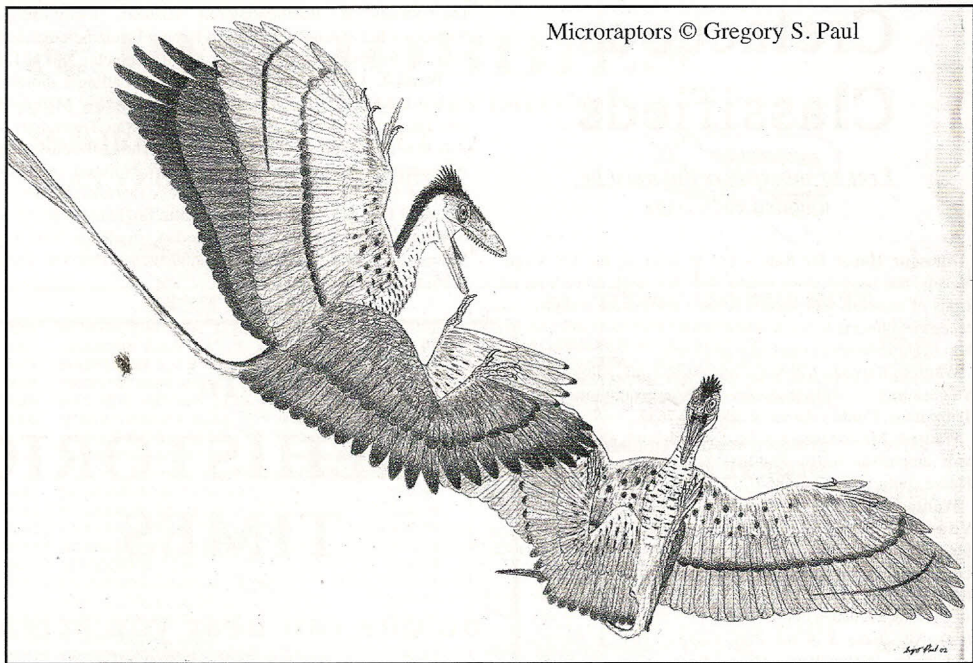
V.C.: The *Scientific American book of Dinosaurs* is a huge undertaking, with excellent artwork and informative contributions from so many good scientists. How did this project come about; was it your brainchild or something *Scientific American* asked you to accomplish?

GSP: The publisher of the book was kind enough to ask me to be the editor. That is not really a huge undertaking, since as editor I let others do most of the work.

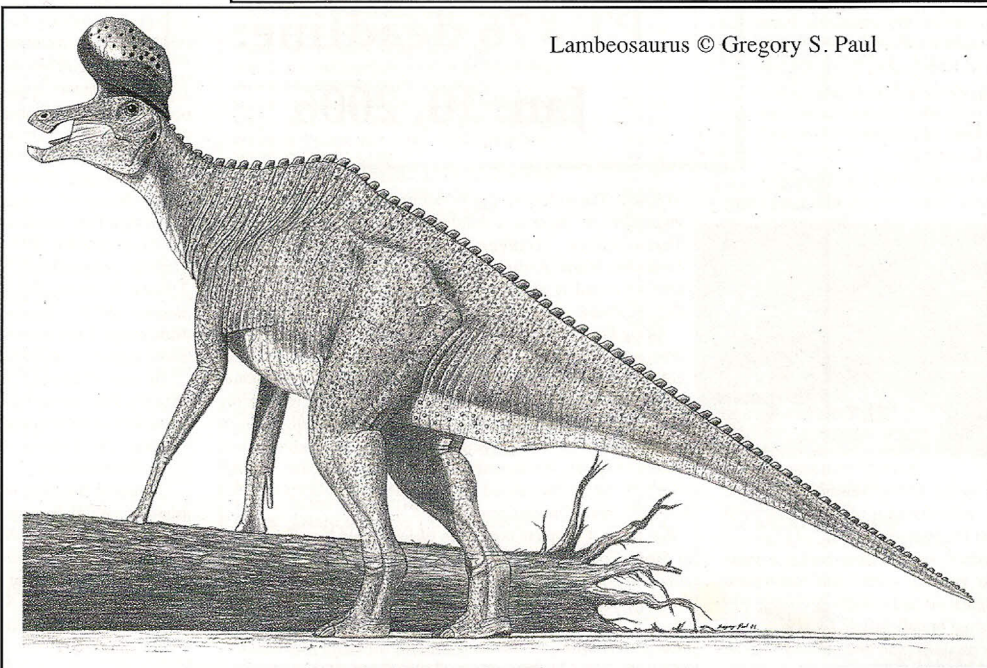
V.C.: Whom would you list as being your biggest influences in your dinosaur art, in terms of past and present individuals?

GSP: One of the biggest was Charles Knight, of course (I did an article on him for *Scientific American* reprinted in the *Sci Amer* book, thereby reducing the work load further). In terms of the art and mood, not the out-of-date morphological details. Then there are the fantastic, hyper detailed Jay Matternes Cenozoic murals at the Smithsonian; I grew up just outside Washington DC. His skeletal-muscle restorations were also influential. Additionally important were the little known, but exquisite Bill Berry Morrison fauna

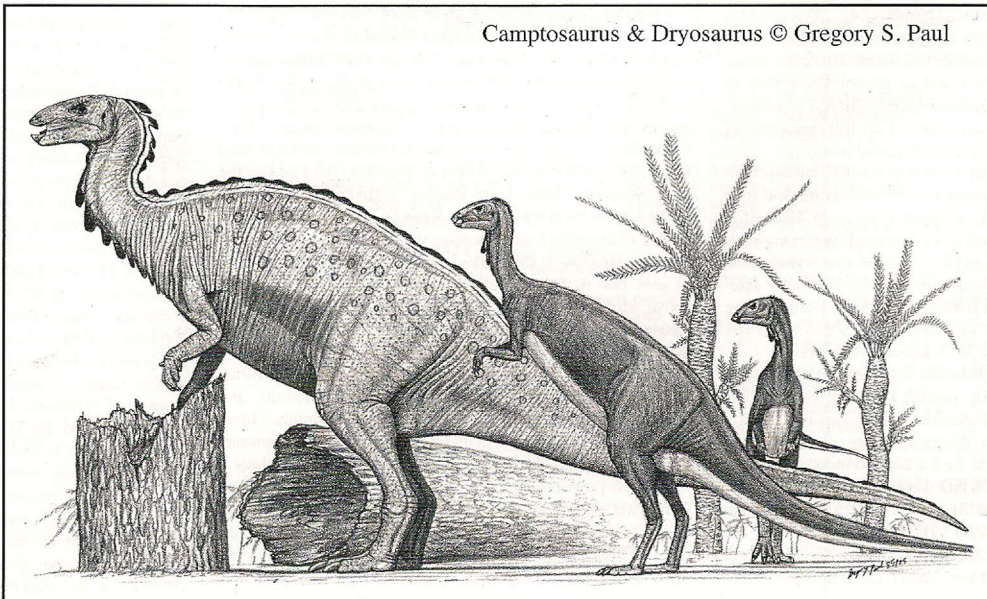
Micro Raptors © Gregory S. Paul



Lambeosaurus © Gregory S. Paul



Camptosaurus & Dryosaurus © Gregory S. Paul



pieces at the Dinosaur National Monument. His snorkeling **Diplodocus** pair is the most evocative expression of the view of sauropods as semi-aquatic ever achieved. Meanwhile the **Allosaurus** chasing **Camptosaurus** would not look out of place in a current book on dinosaurs. It is a shame they are filed away rather than be displayed on the side somewhere. I was delighted to get them published in the *Sci Amer* book.

I was influenced by Burian, Zallinger and the like as well, but to a lesser degree because their work was more free style artistic than anatomically serious. The same was true on William Scheele in his two marvelous charcoal illustrated books from the 1950s, but I love the art anyhow.

V.C.: It seems you

feel that the meteorite impact in the Yucatan Peninsula is perhaps superior to other fundamental ideas regarding dinosaur extinction, yet is not the be all or end all. Are you a proponent of multi-factors which occurred to lead to the KT extinction? If so, what other factors can you extrapolate on and share with P.T. readers?

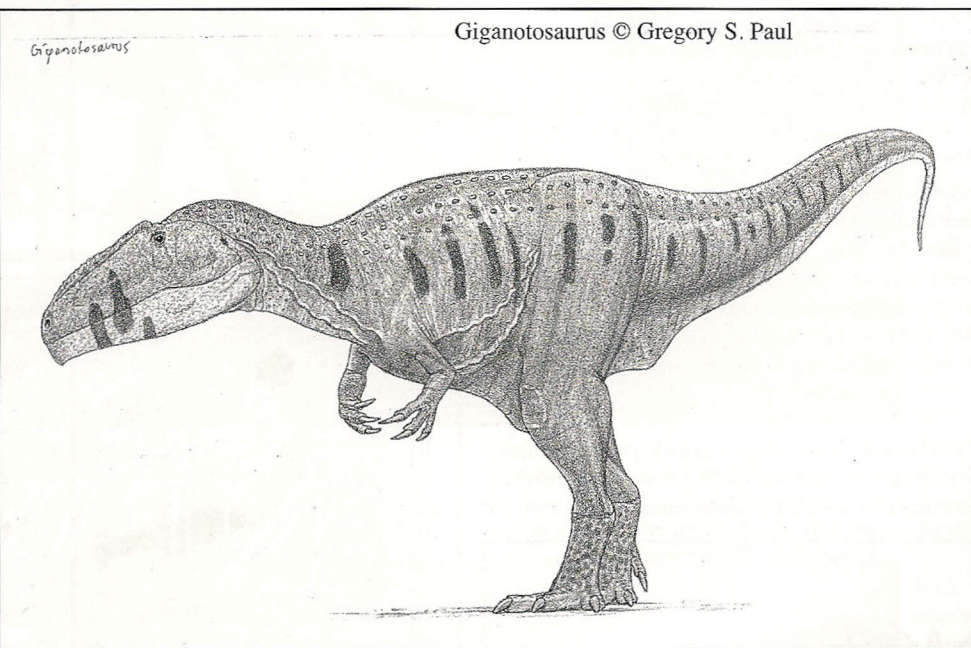
GSP: I'm not sure what the heck was going on. It was 65 million years ago after all. Vulcanism in the form of the Deccan Traps of India may have been involved, or maybe not. What remains unknown is how the fast breeding dinosaurs could have been wiped out when the disaster left so many other forms alive. Most dinosaurs reproduced so rapidly that they were like rabbits. They were a "weed species" that should have been able to recover even if only small populations were left over. What is truly absurd is the paper in the Geological Society of America Bulletin (2004, 116: 760) that said dinosaurs could not escape the initial heat pulse from the pyrosphere (the intense heating of the upper atmosphere by the massive reentry of debris from the impact) because they could not get in the water or underground. They actually repeated the old cliché that dinosaurs could not swim. And of course a number of small dinosaurs could have found refuge in burrows, caves, deep ravines etc. In any case populations protected by heavy rain storms would have survived the heat flux, which lasted only a few hours.

V.C.: What was it like working as a consultant to "Jurassic Park" and Disney's "Dinosaur?" Any opinions on the B.B.C.'s "Walking with Dinosaurs" series?

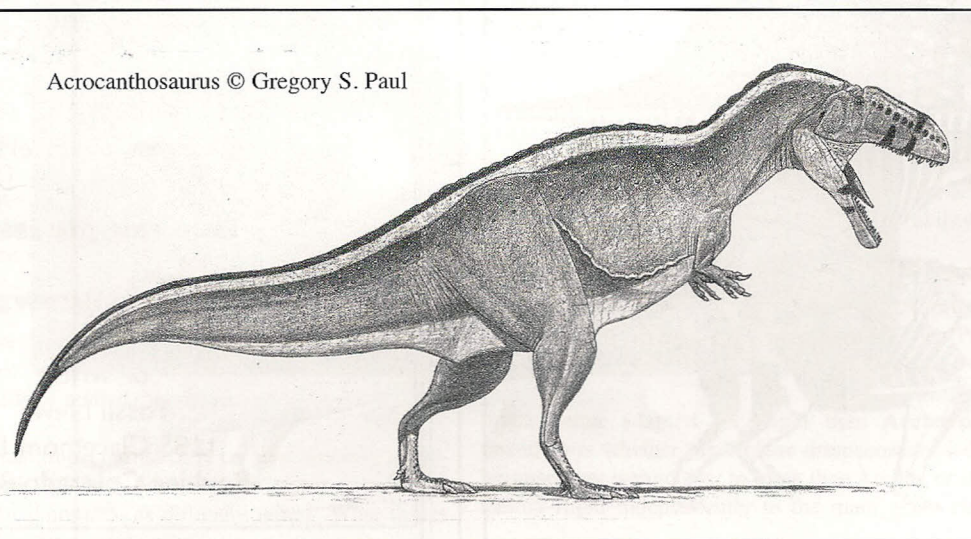
GSP: I barely worked on



Gorgosaurus © Gregory S. Paul



Giganotosaurus © Gregory S. Paul



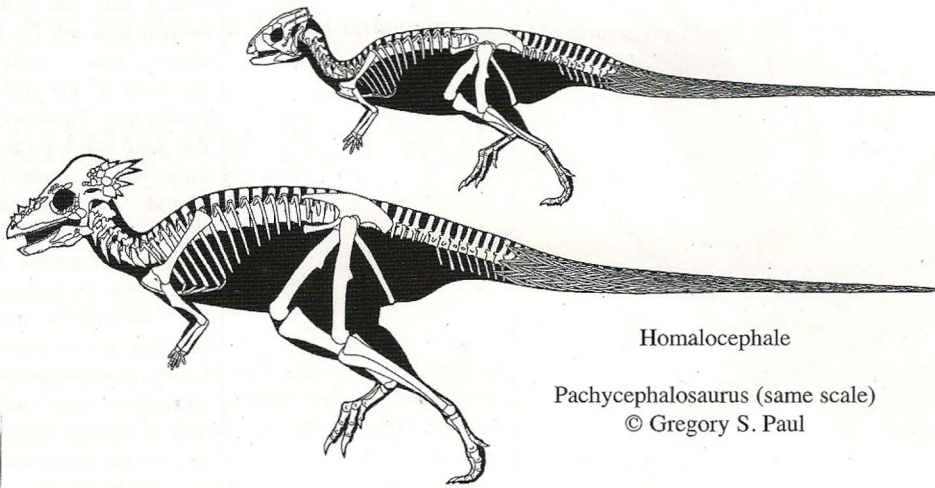
Acrocanthosaurus © Gregory S. Paul

the Disney movie, which was OK for what it was. For JP, I also was only involved in the pre-production. The work did have some influence, but of course I would have done things somewhat differently. Of course I told them to feather the dromaeosaurs, but that was a moot point since computer animation was not able to handle feathers at the time and can still barely do so. I differ with the BBC series on a number of details of their dinosaur restorations. Of course there are general complaints about how one view of science is presented in the dinos and wildlife documentaries.

V.C.: Getting more specific about dinosaur anatomy, why is the absence of chevrons under the tail of pachycephalosaurs so significant?

GSP: They are absent under the tail base. This simply means that the space available for a peculiar extension of the digestive tract to behind the pelvis had taken place. This posterior part of the digestive tract was supported by unusually broad transverse processes. The arrangement seems to have something to do with increasing the ability of the digestive complex to process the plants they ate.

V.C.: When restoring the life appearances of ceratopsians, I've noted that you equate their musculature as similar, but more massive, than extant rhino's. Is it the sheer robust nature of their bones that steer you in this direction? What



Homalocephale

Pachycephalosaurus (same scale)

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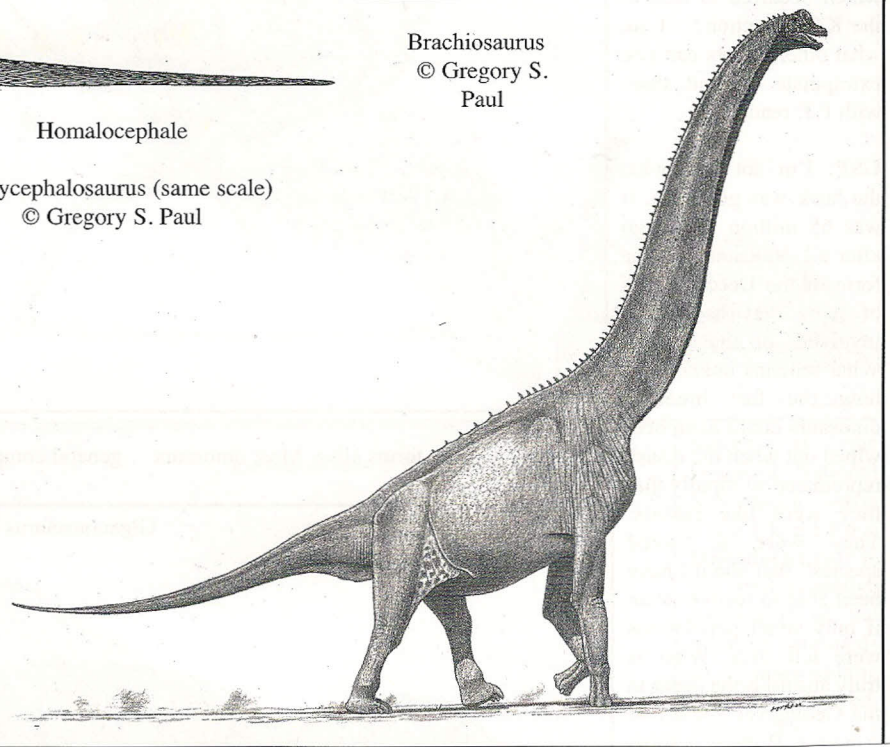
ornithischians, as well as therizinosaurs, probably had elastic cheeks that contained food as it was orally processed. The tooth rows were usually set close to one another, leaving limited space in the oral cavity, while the cheek pouches were quite deep. Looks like they were chomping up the plant parts into little pieces that fell into the cheek pouches, to be swept back into the mouth with a long, supple tongue, and rechomped until

other features do you regard as unusual in ceratopsians?

GSP: Ceratopsians were much more strongly built than rhinos in terms of bone robustness. Also, they had enormous pelvic girdles, and the limbs were longer than rhinos of equal mass. All this implies that ceratopsids had larger leg muscles than rhinos. This was probably to give the the ability to fight off the enormous tyrannosaurids – of course Happ has just shown that **Tyrannosaurus** engaged in direct combat with **Triceratops**, one of the latter having healed bite marks on its skull. Rhinos do not have to contend with such super predators.

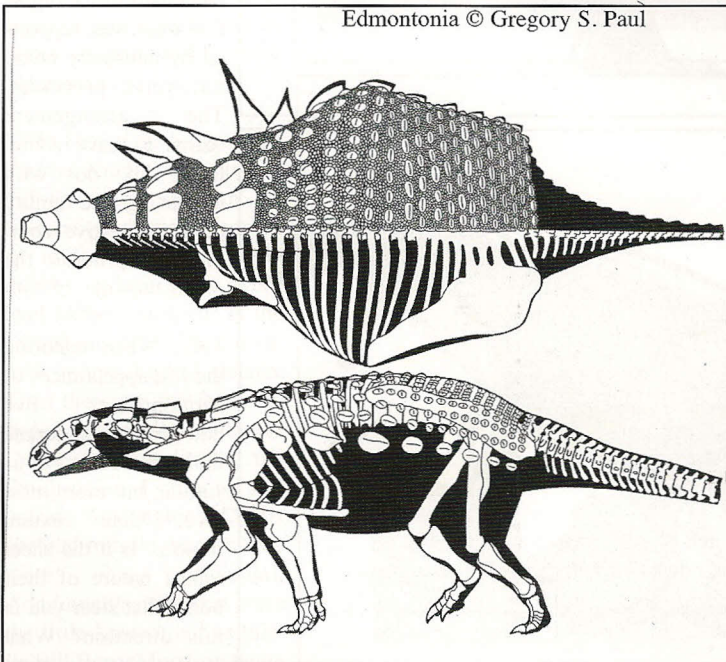
V.C.: The debate on "cheeky" ornithischians seems to pop up a great deal. Jack Horner and Michael Brett-Surman say that without cheeks they would've been very poor eaters. Some others feel that cheeks and other facial muscles are a purely mammalian trait and don't belong on a reptilian or aves-like character. What is your ultimate stance on this, and have you seen any evidence of ligamentation or other muscle tissue markings on fossilized skulls and jaws to permit the presence of cheeks?

GSP: Condors have well developed elastic cheeks that shorten the lengths of their mouths. We know that ankylosaurs had cheeks that almost reached their beaks because they are actually ossified in some cases. Most if not all



Brachiosaurus
© Gregory S. Paul

Edmontonia © Gregory S. Paul



they were ready to swallow. It is hard coming up with a way that ornithischian mouths worked without cheeks.

V.C.: What is your stance on the importance of **Brachiosaurus**, or **Therizinosaurus** having a pelvis rotated backward relative to the trunk vertebrae? How does this differ from most theropods and bipedal Ornithischians?

GSP: As I explained in PDW, when most theropods reared up, the forward rotation of the pelvis threw things out of whack and it was not possible for them to move fast. Most therizinosaurids had retroverted pelvises because they always moved about with the trunk angled up about 45 degrees. The pelvis and tail remained horizontal and fully functional regardless of speed this way. In a number of sauropods, camarasaurids, mamenchisaurids, euhelopids, and brachiosaurids, the pelvis was retroverted. In most this arrangement does not make sense unless the animals were rearing up and slowly walking about on their hindlegs on a fairly regular basis, probably mainly to move about as they feed as high as possible. In brachiosaurids the trunk was always tilted strongly up because the arms were so long.

V.C.: I've always pondered the relatively extreme differences between dinosaur feet and their hands. Any personal theories or hypothesis as to why there exists such differences?

GSP: Probably because the group has a bipedal heritage. In no group – not even in long necked sauropods and ceratopsids – was the majority of body mass borne by the arms (unlike elephants and large ungulates), and the hands never developed large pads like those found on the hindfeet of a number of big dinosaurs.

V.C.: I find it very interesting that you regard **Archaeopteryx** as not only a theropod, as opposed to an actual bird, but also likely Dromaeosaurid. Could you please enlighten P.T. readers as to how and why you came to this conclusion?

GSP: **Archaeopteryx** was not a Dromaeosaurid; that's a specific family. But, as many researchers agree, the two groups are much more similar to one another than they are to anything else. Basically, they share a similar overall morphological grade, with **Archaeopteryx** being more avian in some ways, and dromaeosaurids in others. Sorting out the exact position of these types relative to birds requires more research, and more fossils of related dino-birds.

V.C.: You have had such a giant impact artistically on how dinosaur anatomy is viewed and interpreted. Micheal Brett-Surman views you as the "Pioneer" of the new look for dinosaurs, as do many others. What things

were you seeing earlier on that instinctually made you disagree with earlier orthodox thinking regarding dinosaur illustrations and interpretation?

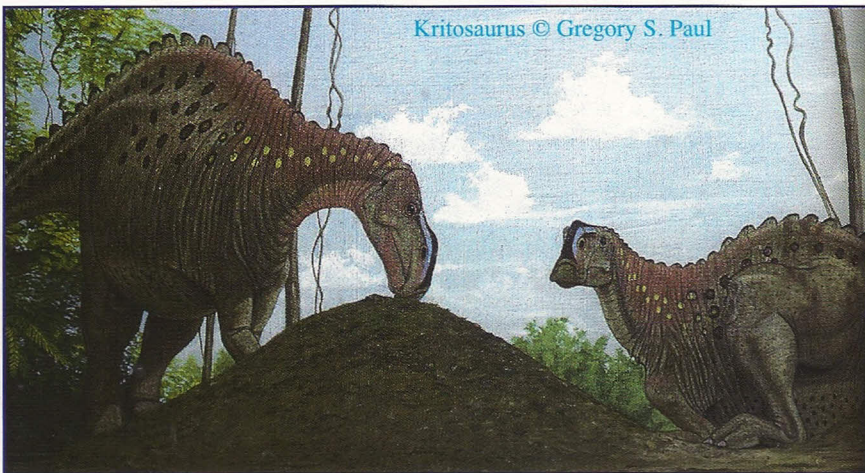
GSP: Good old Knight kept putting wee, narrow, lizard-croc like muscles on his dinosaurs even though they had large pelvic plates that clearly supported enormous leg muscles like modern birds and mammals. Animals with high aerobic exercise scopes have larger limb muscles than reptiles. This always sort of bothered me when I was a kid and teen doing dinosaur pictures, but I did not know quite why. This problem disappeared when the concept that

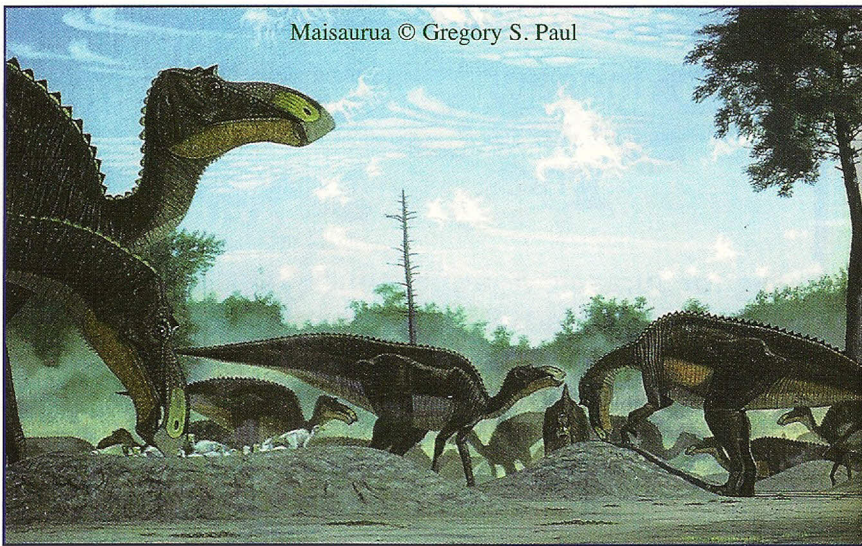
dinosaurs were as aerobically energetic as birds and mammals came out in the 70s. I immediately started putting large, broad thighs on all dinosaurs, and big drumsticks on the faster, flex legged forms with big knee crests.

V.C.: Do you have any new revelations to add to your unique hypothesis of secondary flightlessness? In other words, what new info has emerged to make you feel that dromaeosaurids, troodontids, oviraptorosaurs, etc., are not dinosaur ancestors or cousins, but actual birds who lost their ability to fly?

GSP: I covered that pretty thoroughly in the article I did for Prehistoric Times issue #60. No two ways about it, the winged dromaeosaurids were

much better adapted for flight than **Archaeopteryx**. What remains unknown is whether the biplane dromaeosaurids were more advanced fliers because they were closer to birds than Archie, or if they developed sophisticated flight independently to the main avian clade. Need more fossils,





Maisaurua © Gregory S. Paul

especially from the Jurassic.

V.C.: What is significant with regards to some dinosaurs lacking a clavicle brace that fixed the shoulder into place?

GSP: That means they could move the shoulder blades. Actually, even a number of lizards with well developed clavicle braces have a lot of scapular movement. Heck I can move my shoulders around a lot despite my collarbones. The presence of clavicles attached to one another in prosauropods and maybe sauropods as shown in the latest *Journal of Vertebrate Paleontology* is not evidence for fixed shoulders. The clavicles were loosely attached and allowed for a lot of movement. I was disappointed that the paper did not mention Farrish Jenkins' work on lizards with mobile shoulders. It was a paleo boo-boo; somebody slipped up.

V.C.: I've noticed that some of your illustrations of crested hadrosaurs, such as *Parasaurolophus*, for example, entertain the notion of a frill-like structure joining the neck to the crest. Is this a personal belief?

GSP: It's not a belief, it's a reasonable speculation.

V.C.: Do you have any thoughts on dinosaur migratory behaviors? For example, conjecturally speaking, do you think that dinosaurs migrated as individual species, like birds, or is there some plausibility in the idea that several separate species of ornithischians migrated in herds together, some larger, some smaller, in what would effectively be a type of symbiosis?

GSP: It has yet to be demonstrated that dinosaurs migrated truly long distances, though it is possible within certain limitations. If they did migrate they would have done so in a pattern that would be similar to that of land mammals, not flying birds.

V.C.: Chapter Eight of the *Scientific American Book of Dinosaurs*, "the Paleofuture", is fascinating. In the five years since the book was published, have you seen any of the trends that you speculated upon coming closer to fruition? If so, do you fear humanity will face the same type of mass extinc-

tion due to high tech trends in cyber-intelligence as the dinosaurs did with environmental impacts?

GSP: Obviously field paleo is going increasingly hi-tech as ground scanning radar is increasingly used and so forth. Some archaeological sites are now being scanned in high detail rather than excavated, this will become more and more true of paleontology. I will not even begin to go into how dinosaurs are being researched in depth in the lab to levels never seen before.

Why would I fear humanity going extinct as we replace ourselves with hyperintelligent robots? That's evolution, baby! Looks like folks will be downloading their minds into cyber-forms in a few decades. Now that's real progress. Just read *Beyond Humanity* which I co-authored awhile back. That's still in print. It's a wild ride.

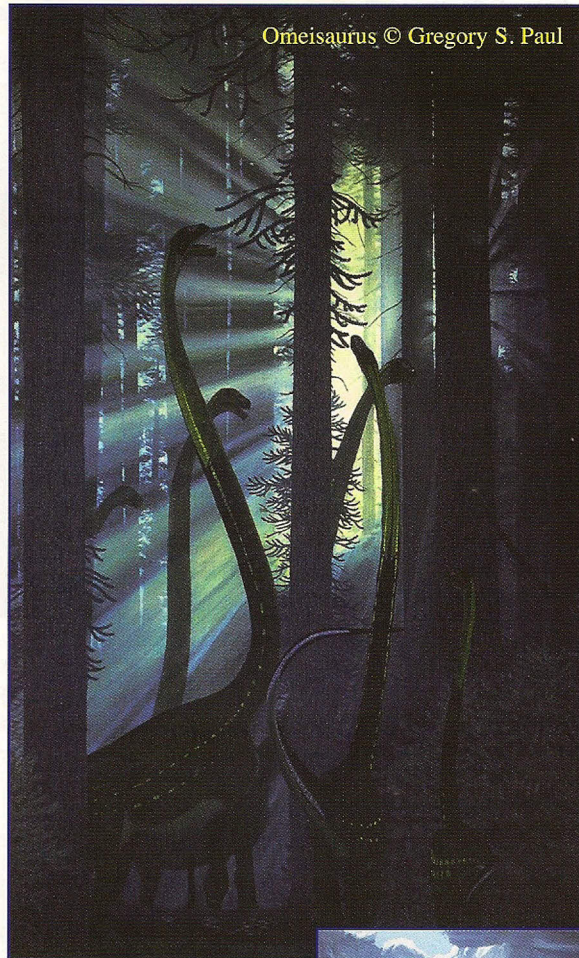
V.C.: What new projects are you currently involved in?

GSP: I am shifting a lot (but not all) of my research into issues of science, religion and society. Just published a paper in the *Journal of Religion and Society* (it's on-line, enjoy) that shows that the more anti-evolution and religious the people in a developed nation are the worse the nation over all is doing in terms of societal health. The USA, being by far the most religious and opposed to Darwinian science, is a societal basket case. Sigh. The research has been covered in newspaper articles and columns around the globe; I've been doing radio and TV appearances worldwide – including FOX News where all is fair and balanced (not) - and I intend to do a major popular book on the subject. Never got this kind of coverage doing dinosaurs. Sure, dinosaurs are great. But most of them have been extinct for 65 million years.

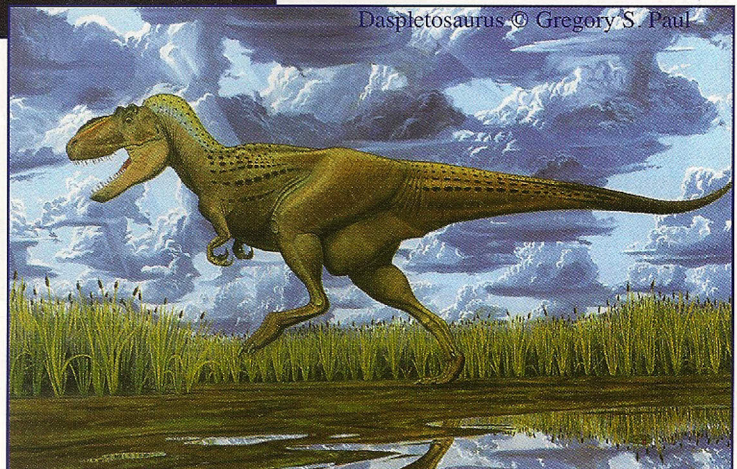
V.C.: Where do you hope to see the future of Paleontology headed?

GSP: Oh, what's the diff? With humans, paleontologists and otherwise being replaced by cyberbeings sometime this century, let them take care of it. They will certainly do an even better job.

V.C.: On behalf of PT, Thank You, Greg!



Orneisaurus © Gregory S. Paul



Daspletosaurus © Gregory S. Paul