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"A LOVE OF FOSSILS BRINGS US TOGETHER"

Calendar

2015

2016

April 1-3
MAPS EXPO XXXVIII
Location: Sharpless Auctions
Exit 249 I-80
Iowa City, Iowa
Theme: Mesozoic Era
Keynote Speaker: Phil Currie
Topic: TBD
NOTE: Hotel Show moved to Clarion Hotel

DUES ARE DUE

Please send your 2015 MAPS dues to:

James Preslicka
1439 Plum Street
Iowa City, IA 52240

Contributions to Digest Needed

The Digest editors encourage the members to submit articles for publication in the Digest issues. The Digest is for the members and should reflect their interests. If you have specimens that you collected and would like to share with other members or would like to describe a favorite collecting site, please write an article in Word, Times New Roman size 12 font, single spaced with one inch margins, and send to the editors. Photos and diagrams can be e-mailed separately or incorporated in the article.

John: **Fossilnautiloid@aol.com**
Chris: **CDCozart@aol.com**

Call for Papers

The theme for the 2016 EXPO is the Mesozoic Era. Any paper dealing with Mesozoic geology or paleontology would be appreciated. The papers should be in Word, Times New Roman, size 12 Font, single spaced with one inch margins, and e-mailed to one of the Digest Editors by the first week of February 2014. Diagrams/Photos can be sent separately or imbedded in text.

John: **Fossilnautiloid@aol.com**
Chris: **CDCozart@aol.com**

About the Cover

This month's cover is a photograph of an arthropod (probably trilobite) trackway collected in rocks of the Ordovician Kope Formation near Fort Thomas, Kentucky. The specimen was collected and photographed by John Catalani.

(Editors' Note: The following paper would have, except for a failure of an Internet transmission, been included in the 2015 EXPO Digest on the Cenozoic. We print it here and will add it to the digital version of the Digest that will eventually be available at the MAPS website.)

Reassessment of the Fossilized Eggs Commonly Attributed to *Stylemys nebrascensis* from the White River Formation

Donald D. Smith[1] and Gilbert D. Parker[2]

[1]Buccaneers, Baubles and Bones, L.L.C., 501 NW 39th St. Blue Springs, MO 64015,
E-mail: don.d.smith@sbcglobal.net, Tele: 816-896-6117

[2]Parker Paleontological Enterprises, Inc., 15505 E. 44 Terrace, Independence, MO 64055
Tele: 816-678-1943

ABSTRACT

Joseph Leidy (1851) first identified the fossilized Oligocene tortoise *Stylemys nebrascensis*, and fossilized eggs measuring almost 50 mm in length were attributed to this species (Hay, 1906). Today one often sees fossilized eggs attributed to *Stylemys* advertized for sale on eBay and other internet fossil sites. Measurement of these fossilized eggs may vary considerably, e.g. from less than 25 mm to over 50 mm. The smallest hatchlings of *Stylemys* we have seen both measured 52 to 55 mm and would be sized appropriately for the egg measured by Hay. *Gopherus aggassizii*, a modern relative of *Stylemys* but averaging 70% smaller, has eggs and hatchlings measuring 45 and 38 mm, respectively.

We examined and measured 127 fossilized ova from Converse Co., WY, collected from the White River Formation. The smallest was 16.5 mm long, and the largest was 40.2 mm long. Although some shrinkage may accompany the fossilization process of ova, it is unlikely that any of the eggs we measured for this study would accommodate a hatchling of *Stylemys nebrascensis* measuring 52 mm in length. It is more likely that these ova are attributable to smaller aquatic turtles belonging to the families Emydidae or Trionychidae, or to lizards such as those belonging to the genera *Glyptosaurus* or *Peltosaurus*.

INTRODUCTION

Joseph Leidy (1851) first identified *Stylemys* (*Gopherus*) *nebrascensis* and fossilized eggs were attributed to this species by Hay, 1906. Since then, virtually any fossilized reptilian eggs from the White River Formation have been attributed to this tortoise. The eggs that Dr. Hay measured were slightly elongated and measured almost 50mm in length and were likely correctly identified. Today, on eBay and other internet sites, advertisement of the fossilized eggs of *S. nebrascensis* abound. In truth, most of the smaller eggs seen for sale are probably from smaller aquatic turtles belonging to the families Emydidae or Trionychidae, or lizards that were undoubtedly more abundant during the late Eocene and Oligocene than the tortoises ever were. Boyce and Haag (1991) list four genera of lizards from the Chadron or Brule: *Glyptosaurus*, *Peltosaurus*, *Hyporhina*, and *Rhineura*. *Glyptosaurus* and *Peltosaurus*, the two largest forms, measured 30 to 50 inches (~1000 mm) and 12 inches (~300 mm) in length, respectively. Lizards are typically more numerous than tortoises in a given habitat, and if ova of lizards are as readily fossilized as those of tortoises, it is very likely that fossilized lizard eggs would far outnumber tortoise eggs.

METHODS

Fossil ova and tortoise specimen were obtained from the White River Formation, Converse Co., WY. They were measured in millimeters (mm) using digital calipers. The lengths of the eggs were measured at the widest diameter, and at the thickest depth, where the matrix had been removed down to the fossil. Carapace length of the *Stylemys nebrascensis* was measured. Graphics were produced using Microsoft EXCEL.

RESULTS

Figure 1 is a photograph of examples of the fossilized ova, and hatchling *Stylemys nebrascensis* from the White River Formation that were measured in this study. Figure 2 shows the distribution of length measurements versus depth measurements of 127 fossilized reptilian ova from Converse Co., WY. The smallest egg measured 16.5 x 9.7 mm and the largest egg measured 42.2 x 14.7 mm (mean = 28.9 x 13.4 mm). The distribution appears to be continuous over the range of measurements with no obvious clumping. When the data is stratified and presented as frequency distribution (Figure 3) the resulting plot is bell-shaped with the largest numbers of specimens being between 21 and 35 mm in length.

Figure 1. A photograph of three examples of the fossilized reptilian ova, and a fossilized hatchling of *Stylemys nebrascensis* from the White River Formation, Converse Co., WY that were measured for this study.

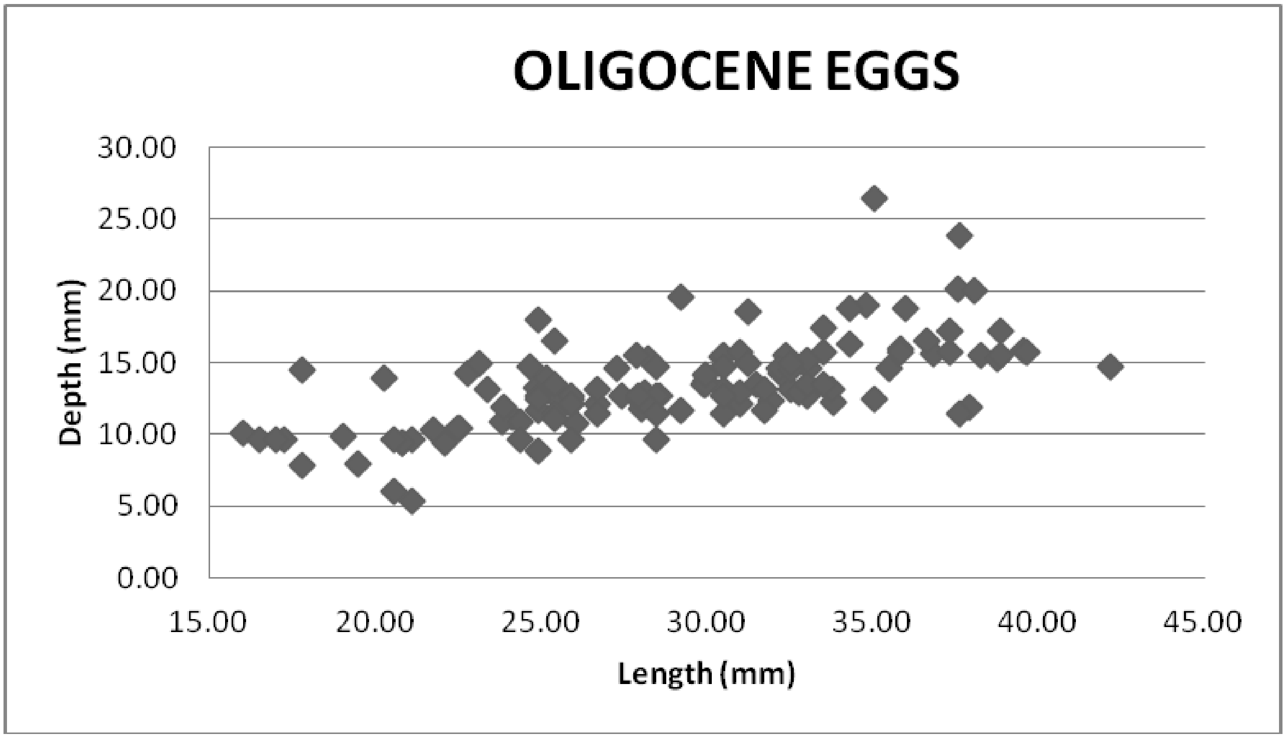

Figure 2. Dot plot of length measurements versus depth measurements (in mm) of fossilized reptilian ova from the White River Formation, Converse Co., WY.

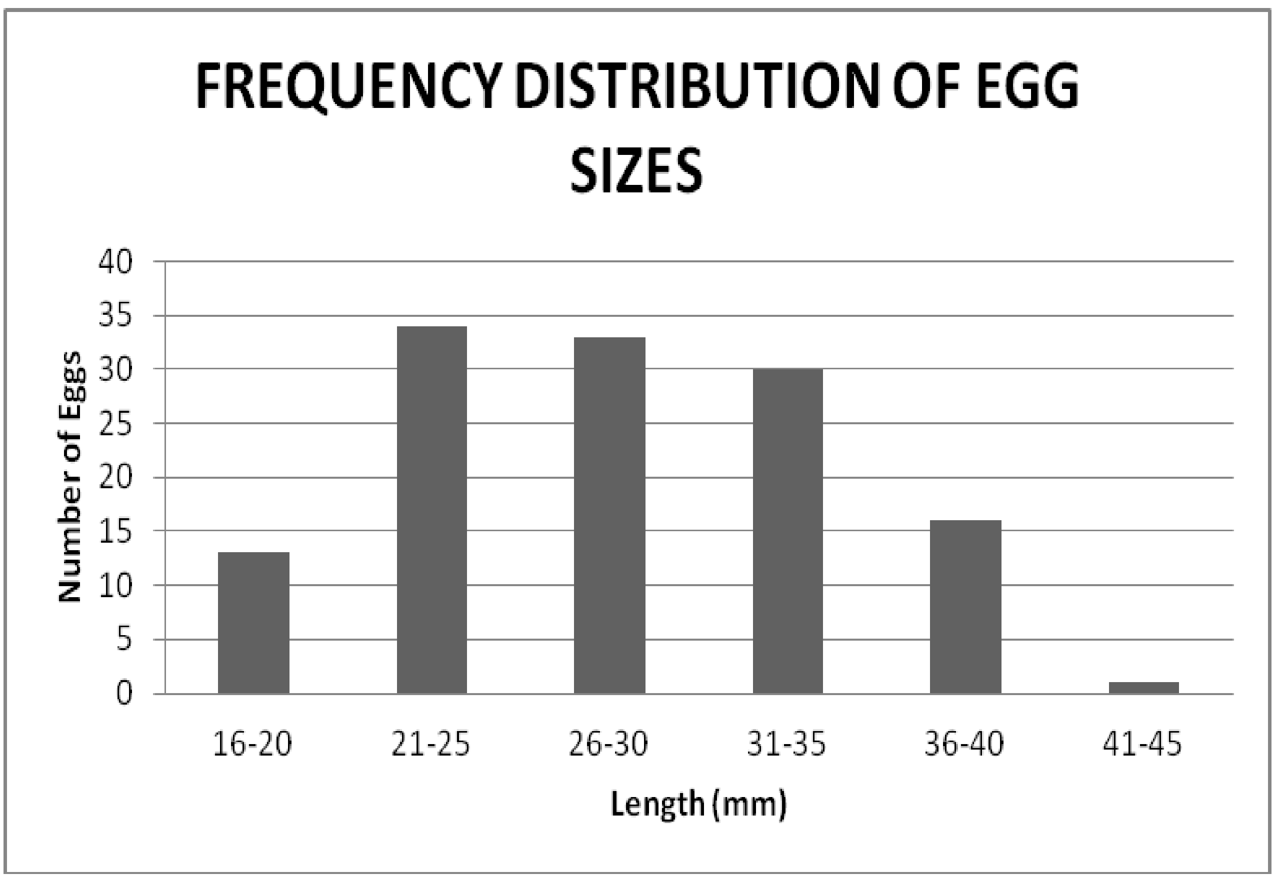

Figure 3. Frequency histogram of stratified length measurements (in mm) of fossilized reptilian ova from the White River Formation, Converse Co., WY.

DISCUSSION

Size: Numerous fossils have been excavated from the White River Formation that appear to be reptilian ova. The primary argument against all of these eggs being attributed to the tortoise *Stylemys* is a matter of size. The smallest fossilized tortoises we have observed are two specimens, both measuring approximately 52 to 55 mm in length (DDS 2633 and DF [Douglas Fossils] 3940) both from Converse Co., WY, collected by Kent Sundell. We estimated that present day species of tortoise e.g. *Gopherus agassizii*, closely related (if not con-generic) to *Stylemys* are 70% smaller in size than their extinct relatives. *G. agassizii* has a reported carapace length of 250 to 350 mm (Stebbins, 1954) whereas *Stylemys* may occasionally measure up to almost a meter in length (O'Harra, 1920). Stebbins (1954) states hatchling *Gopherus* measure about 1.5 in. (38 mm) with eggs measuring about 45 mm in length. A stillborn hatchling still with a yolk mass attached collected (DDS) from Rock Valley, Nye Co., NV, measured 37.8 mm in length by 31.6 at mid-carapace (KU 177162). Thus a hatchling *Gopherus* is about 73% of the size of the *Stylemys* hatchling, and eggs of *Stylemys* should measure about 62 mm (~2.4 in.) in length approaching those described by Hay.

For the largest, measured, fossilized egg to be from *Stylemys*, the original egg would have had to shrink from ~62 mm to ~42 mm, or a loss of 32% of its length. Though there is undoubtedly some shrinkage during the fossilization process, the surfaces of most ova show little signs of wrinkling or distortion (though there are exceptions), most are indeed smooth, and the preserved egg shell appears to be intact in many cases. Shrinkage from 62 mm down to 17 mm would be even more unlikely.

Preservation: It is true, because of the thick shell and large limb bones of *Stylemys*, that this tortoise is one of the most commonly observed vertebrate fossils of the White River Formation. In contrast, fossils of pond and river turtles and lizards from the White River Formation are considered to be as rare as the tortoises are common. However, this apparent difference in numbers of tortoises versus the number of turtles and lizards could easily be explained by the bias of preservation for the massive shell and limbs of the tortoise. Simply stated, when a predator captures a smaller turtle and especially a lizard, it is usually gone in one or two gulps, while the shell of the tortoise will be lying on the ground for a long time, and available to the forces of preservation and fossilization. Even if the shell of the pond turtle or carcass of the lizard is not consumed, the fragile petite bones of the smaller turtle or lizard are much more likely to be scattered by the forces of dispersion, and overlooked or missed by the paleontologist or collector. The fact that the fossilized skulls of the tortoise are a rare find, further support this premise. Their rarity was commented on by O'Harra (1920) when he said although hundreds of shells of *Stylemys* were present in museums all over the world, at that time, only two skulls were known to exist. The skull of *Stylemys* is robust when compared to that of a pond turtle or a lizard, however, they were probably often devoured by a predator or scavenger. If not, when the flesh is gone, the bones of the skull become readily disarticulated, and dispersed. The skull of a lizard being much more fragile is even more susceptible to such forces of nature.

Demographics: Based on present day demographic studies, it is highly unlikely that the tortoises outnumbered the smaller fresh water turtles or lizards that were sympatric with them during the Oligocene, and that the fossil record as it relates to adult animals is simply biased in favor of the tortoises. A modern study of *Gopherus agassizii* and sympatric lizard populations carried out on the Nevada Test Site's Rock Valley, Nye Co., NV, under the auspices of the International Biological Program supports this hypothesis (Medica and Smith, 1974). Based on a census of reptilian populations over several years, the density of *Gopherus agassizii* was found to be 0.7/hectare (ha), while populations of four lizards with minimal adult head-body lengths from 62 to 107 mm were found to be 19.2, 2.3, 1.8 and 1.0/ha for the Tiger Whiptail (*Aspidoscelis tigris*), the Mojave Horned Lizard (*Phrynosoma coronatum*), the Zebra-tailed Lizard (*Callisaurus draconoides*) and the Short-nosed Leopard Lizard (*Gambelia wislizenii*), respectively. Another species *Uta stansburiana* having a head-body length of only ~45 mm was even more abundant with densities ranging from 21.4 to 47.5/ha.

Fecundity: Fecundity data of modern reptiles should give us insight into the numbers of eggs produced by the Oligocene reptilian fauna. *Gopherus agassizii* may lay from 2 to 9 eggs per clutch and probably only one clutch per year (Stebbins, 1954). A modern small lizard, *Uta stansburiana*, may lay as many as 6 or even 7 clutches per year averaging 4 or 5 eggs per clutch (Turner, Medica and Smith, 1974). *Gambelia wislizenii*, a large predatory lizard have an average clutch size of 6.2 eggs per clutch, may have up to 14 eggs per clutch, and may have two clutches per year (Turner et al. 1969). Modern turtles such as *Apalone sp*. and *Chrysemys sp*. may lay as many as 10 to 30 and 2 to 20 eggs, respectively (Stebbins, 1954). If the conditions favoring fossilization are similar for the eggs produced by small turtles, lizards, and tortoises, then pond and riverine turtle eggs and lizard eggs should far outnumber tortoise eggs.

CONCLUSION

We believe that many of the oval, sub-cylindrical fossils found in the White River Formation are fossilized reptilian eggs. We do not believe that the smaller ones were produced by the tortoise, *Stylemys nebrascensis*. We believe only the larger ones measuring at least 45 to 50 mm or larger could have been produced by this large land tortoise. The smaller ones measuring 20 to 40 mm were probably produced by smaller aquatic turtles such as *Apalone*, *Graptemys*, and *Chrysemys*, or by lizards such as *Glyptosaurus* or *Peltosaurus*.

ACKNOWLEDGEMENTS

We thank Dr. Kent Sundell of Douglas Fossils (Casper, WY) from whom we obtained most of the fossil eggs and the fossilized hatchlings of *Stylemys nebrascensis*, and the late Dr. Joseph Collins and John Simmons of the University of Kansas (Lawrence, KS) for measuring the hatchling *Gopherus agassizii* (KU 177162) housed at Dyche Museum at the University of Kansas, Lawrence.

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EXPO XXXVII KEYNOTE SPEAKER LANCE GRANDE

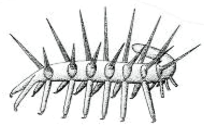
Keynote speaker Lance Grande seen with Irene Broede who arranged for Lance to speak at EXPO.

AWARDS PRESENTED AT 2015 MAPS EXPO

Don Szczodrowski receiving the Sharon Sonnleitner Award presented by MAPS president Marv Houg.

Steve Nicklas receiving the Don Good Award presented by Show Chairman Tom Williams.

The PRI Katherine Palmer Award presented by Paula Mikkelsen to Ray Troll who was unable to attend.

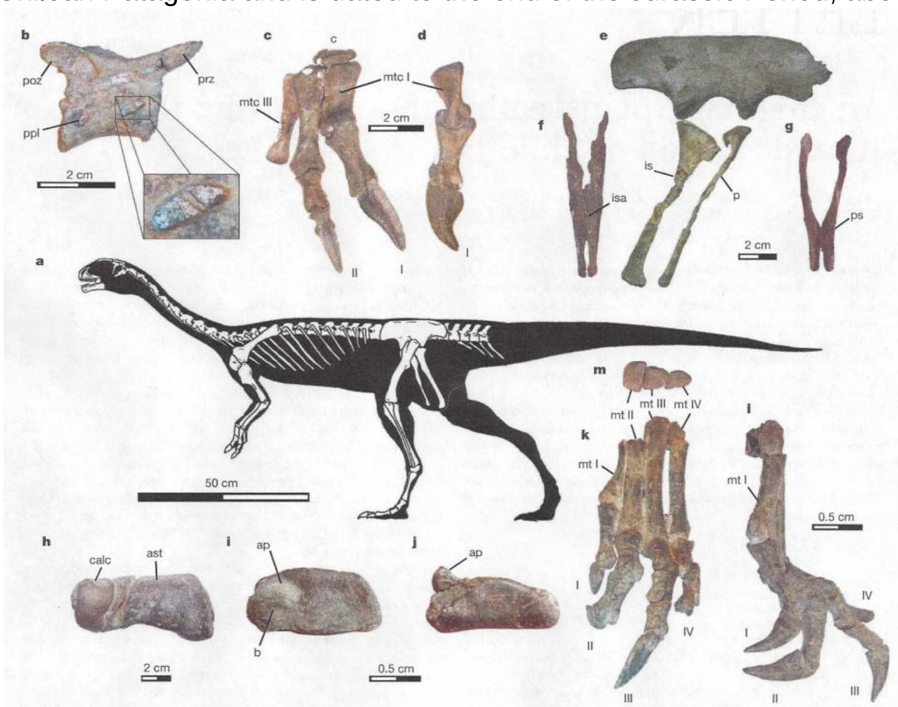


Paleo News Items

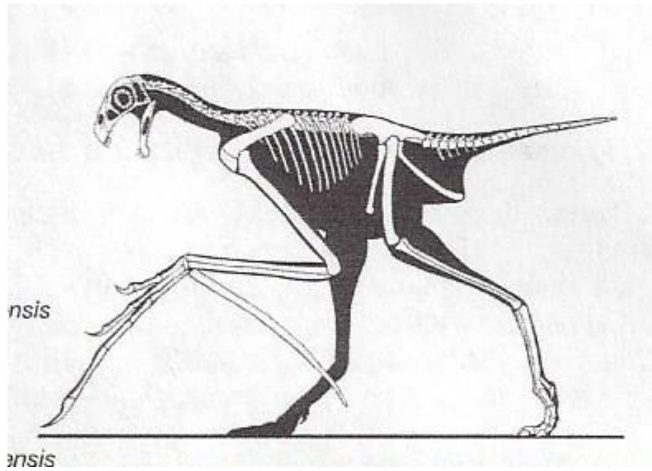
Karen Nordquist

New Plant-eating Theropod from Chile – *Chilesaurus*

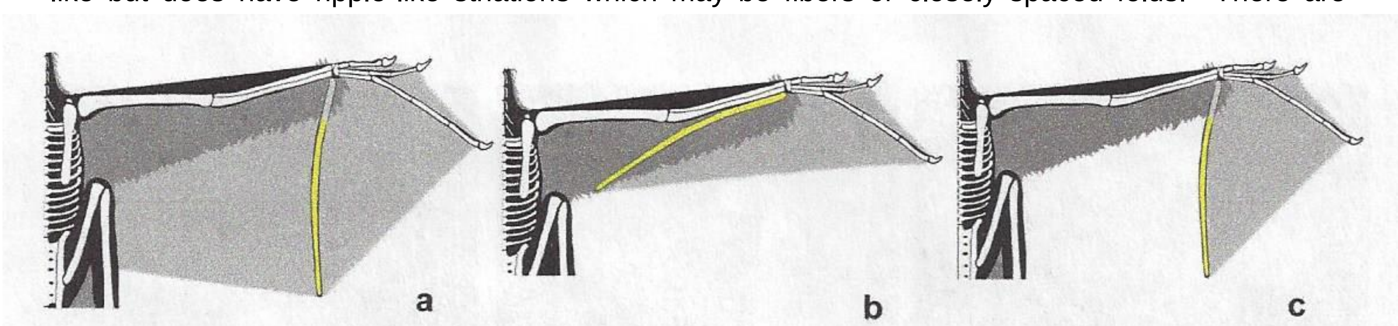
The first fossil of this new dinosaur was discovered in the Toqui Formation in Aysen, south of the Chilean Patagonia and is dated to the end of the Jurassic Period, about 145 Mya by a 7 year old boy (Diego Suarez) exploring with his geologist parents. At first they thought that they had the bones from several different species, but since then they have found more than a dozen skeletons, including four complete skeletons. It is named *Chilesaurus diegosuarezi* after its country of origin and its finder and is indeed a bizarre herbivorous basal tentanuran that is challenging the evolutionary story of early dinosaurs. The holotype is a nearly complete skeleton that is 1.6 m (5.3 feet) long which is 50% that of the larger specimen, indicating that this is not a mature animal. The other four specimens vary from 1.2 to 3.2 m (3.9 to 10.5 feet) long. It has a mix of sauropod and theropod features; the teeth are tall, leaf-shaped with small serrations on the apex of the crowns like sauropods (photo below shows right dentary); the pubis does not have a theropod-like boot (perhaps for the larger gut needed for plant processing); the limb bones are stout like sauropods but the front limb is 56% as long as the hind limb; the hand claw is short and less curved than most theropods; the first finger is strongly twisted as seen in sauropodomorphs. *Chilesaurus* thus consists of a ceratosaur-like axial skeleton, a “basal tetanuran” forelimb and scapular girdle, a coelurosaur-like pelvis, and a tetanuran-like hind limb – quite a mosaic. It increases the cases of dinosaur conversion to herbivory, showing it was more commonplace among basal theropods than thought. It also complicates the early evolution of dinosaurs. (Novas et al in **Nature**, April, 2015)



New Jurassic Maniraptoran Theropod from China – *Yi*



The diversity of the dinosaur-bird transition increases yet again with this discovery from the Middle-Upper Jurassic Tiaojishan Formation of Hebei Province, China. This new fossil has been named *Yi qi* from the Mandarin for wing and strange (pronounced ee chee). The holotype is an articulated partial skeleton that includes soft tissue on the slab and counter slab. It is classed as a scansoriopterygid (climbing and gliding) theropod and is an adult based on sutures. It is estimated to have weighed about 380 grams. The skull is robust, the snout is short and there are four procumbent premaxillary teeth. The phalanges of digit four are greatly elongated and the most striking feature is a long rod-like bone articulating from the wrist. This structure is not seen in any other theropod but is seen in some extant and flying tetrapods (some squirrels and bats for example, and the pteroid in pterosaurs). The integumentary structures are composed of feathers and membrane. There are thin stiff filamentous branching feathers around the skull and neck and larger feathers attached to the fore and hind limbs. There are several areas of membranous tissues around the rod and the digits of the hands. It is sheet-like but does have ripple-like striations which may be fibers or closely spaced folds. There are



preserved melanosomes on both the feathers and membrane that vary in size with some of the largest ones found to date. The absence of pinnate feathers appears to be a secondary loss in this paravian which is also seen in other close relatives. The highly elongated digit four is similar to that seen in bats and pterosaurs but is unique in theropods. There was probably some flight capability, perhaps gliding, but there is not enough here to accurately reconstruct it (reconstruction here by Zang Hailong). There are three possible reconstructions shown in the drawings above that depend on the location of the rod. This fascinating new fossil offers a surprise aerodynamic innovation near the origin of birds. (Xu et al in **Nature**, April 2015)

The **M**id-**A**merica **P**aleontology **S**ociety (MAPS) was formed to promote popular interest in the subject of paleontology; to encourage the proper collecting, study, preparation, and display of fossil material; and to assist other individuals, groups, and institutions interested in the various aspects of paleontology. It is a non-profit society incorporated under the laws of the State of Iowa.

Membership in MAPS is open to anyone, anywhere who is sincerely interested in fossils and the aims of the Society.

Membership fee: $20.00 per household covers one year's issues of DIGESTS. All Canadian and Overseas members receive the DIGEST by air letter post. For new members and those who renew more than 3 issues past their due date, the year begins with the first available issue. Institution or Library fee is $25.00.

MAPS meetings are held on the 2nd Saturday of October, November, January, and February and at EXPO in March or April. A picnic is held during the summer. October through February meetings are scheduled for 1 p.m. in Trowbridge Hall, University of Iowa, Iowa City, Iowa. One annual International Fossil Exposition is held in late March/early April.

The MAPS official publication, MAPS DIGEST, is published 5 times per year – Jan-Mar, EXPO EDITION, May-August, Sept-Nov, Dec. (EXPO Materials). View MAPS web page at: http://www.midamericapaleo.org

MID-AMERICA PALEONTOLOGY SOCIETY

Mr. John Catalani
MAPS DIGESST Editor
3405 High Trail
Woodridge, IL 60517

CYATHOCRINITES