Florida Fossil horse Newsletter

Volume 10, Number 1, 1st Half 2001

What's Inside?

Fossil Horses On the Road: *Archaeohippus* and *Parahippus* Check Out the Bluegrass State

Lexington, Kentucky welcomed Miocene horses at a special event at the Lexington Children's Museum, March 3, 2001. Loaned by the Florida Museum of Natural History, many fossils of the two small prehistoric horses from Thomas Farm are being

Seth Woodring, 3, of Winchester, made himself a plaster "fossil" with some help from his mother, Beth, and 5-year-old sister, Rayne. David Stephenson photo (reprinted with permission from Herald Leader)

displayed at the Children's Museum through March and April. Touchable casts of the skulls and feet are also charming the kids, who think the "little horses" are just awesome.

At the all-day fossil event, a large display was set up with a case for some of the more fragile horse fossils. Three tables held fossil bones and casts, with modern horse bones for comparison. Experts Dr. Teri Lear and Dr. Lenn Harrison, with the Department of Veterinary Science at the University of Kentucky, presented *Archaeohippus* and *Parahippus* to the public. Teri has participated in several digs at Thomas Farm, and talked with visitors about the Miocene digs and fossils. Information and graphics from the Florida Museum's website "Fossil Horses in Cyberspace" helped interpret the evolution of horses for almost 1,000 visitors.

"Most people were surprised at the size differential between fossil horses and modern horses," Teri said . "They really liked looking at the bones of the limbs and the skulls. They were surprised fossil horses had three toes and that occasionally modern horses are born with one or two extra "toes"...the genes for three toes of the fossil horses are still there in modern horses but normally turned off."

People were impressed that the fossils were 18 million years old and were found in Florida--the land of Disney World and ocean beaches. Some people were curious about where else the fossils might be found.

Some kids even got to take home a souvenir of the fossil horses. Children made casts of *Parahippus* and *Archaeohippus* hooves, along with other fossils, in a special workshop.

In horse-crazy Lexington, *Archaeohippus* and *Parahippus* have acquired celebrity status. In addition to their two-month long visit to the Children's Museum, they will also star in lectures presented by Teri Lear for students in the Veterinary Science Department. Then it's on to the Keeneland thoroughbred racetrack during the April race meet. The tireless Dr. Lear, assisted by Museum staff, will again present the fossils to the public before the day's races.

The Children's Museum offers sincere thanks to the staff of the Florida Museum of Natural History for giving their time and expertise to these exhibits and programs. What better way to inspire imagination and curiousity in the children of Lexington? *Judy Lundquist, Lexington Childrens's Museum*

Meet Our Artists

Cyndi Moncrief and Merald Clark are two very talented artists who have worked on various projects for *Pony Express* of Late. Last year Cyndi created our wonderful *Archaeohippus* t-shirt and in the newsletter (Vol. 9, No. 2) describes her reconstruction of this fossil horse. She is a graphic designer for the Department of Agriculture in Gainesville. Cyndi's husband, Merald, works right next door at the Florida Museum of Natural History where he designs historical dioramas (and may even get to illustrate a dinosaur now and again). Merald created the brand new *Pony Express* Logo and this year's *Parahippus* t-shirt. Here Cyndi playfully browses Merald's equine ears at Gainesville's annual Hoggetowne Medival Faire.

Volunteers Help the Museum While Enhancing Their Own Education

In the early spring of 1995 I was teaching 8th grade science at a middle school in Winter Park, Florida. One day a notice from the county's science supervisor informed me that Dr. Bruce MacFadden at the University of Fla. was reserving a few slots for school teachers to participate in a weekend fossil dig at a place called Thomas Farm. I was intrigued, and gained permission to attend. I was so excited, that I started reading what little I could find about Florida fossils. I bought a tent and fantasized about finding the "big find".

That was the beginning of a love affair that has yet to wane. I haven't missed a Thomas Farm experience since and have even joined the Florida Museum of Natural History and Dr. MacFadden on three Western Adventures to Nebraska, digging there. I've taken part in two "Lab Sessions" at the Museum in Gainesville...learning what happens to the fossils that we find. I participated in the Haile Quarry Sloth Dig with Dr. Richard Hulbert and friends, and have joined two fossil clubs. I made new friends who share my passion for fossiling, and go fossil hunting at every opportunity. I've even convinced my sons that their Mother is not crazy, just thoroughly happy and engrossed in this fascinating avocation.

In the course of all this excitement, I learned a lot - mostly about vertebrates, but very little about invertebrates. I wanted to know more. Roger Portell, the "Invertebrate Man" at the Museum kindly suggested that I volunteer to help him at the Museum, and he would teach me about invertebrates. I live two hours from Gainesville and accommodations in Gainesville for an extended amount of time was a problem. A dear, and generous friend offered me the opportunity to stay at her home and work at the Museum. Needless to say, I took her up on her kind offer.

Mr. Portell was true to his word. He has been patient and thoughtful in showing me

Marcia Wright is organizing newly catalogued fossils collected during 1999 in Nebraska into the western collection at the FLMNH. Erika Simons photo

about the invertebrates. I've learned a lot and feel that my help was appreciated. I've done fun work, fossil cleaning and preparing, cataloging, organizing text references, tedious tasks etc. All of it time-consuming, but very necessary. I am amazed at what needs to be done to keep the collections safe, properly documented, and useful for research.

I have also done some work in the vertebrate section with Erika Simons. We were working on the vertebrate fossils from the Nebraska digs. That appealed to me because I handled things that I had found that were now becoming part of the collection.

All of this is wonderful for me, but these experiences have also given me some insight into the overwhelming, labor-intensive job that the paleontology departments and the Museum face everyday. Volunteers are needed for so many tasks. There are things that we can do to free the staff for the more demanding and technical tasks, and we learn and grow in the process.

I intend to continue my long treks to Gainesville whenever time permits. This is important, rewarding and necessary work...and I feel gratified everyday. I challenge others to find a few days to contribute to helping the Paleontology staff. Call them and let them know that you'll help. There is nothing to lose, and much to gain. The opportunity to work with knowledgeable and well-known experts in paleontology is one you shouldn't miss.

For Volunteer opportunities please contact:

Richard Hulbert (Vertebrate Paleontology Collection Manager) at (352) 392-0736 or e-mail: rhulbert@flmnh.ufl.edu

Russell McCarty (Vertebrate Paleontology Senior Preparator) at (352) 392-6767 or e-mail: cormac@flmnh.ufl.edu

Erika Simons (*Pony Express* Program Coordinator) at (352) 846-2000 ext. 255 or e-mail: esimons@flmnh.ufl.edu

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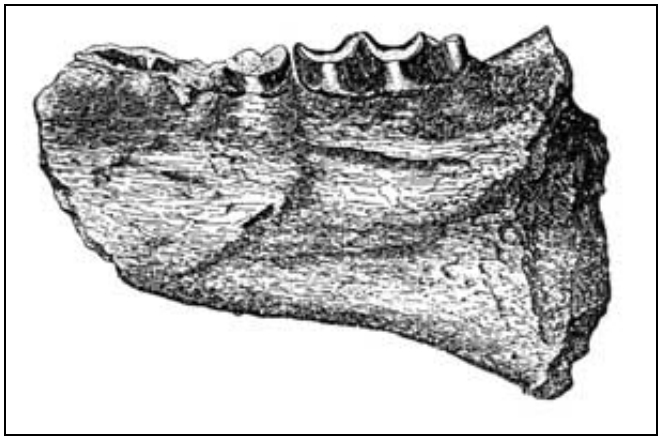
"Thunder Beasts, Sexual Selection, and Extinction"

"And this leads me to say a few words on what I call Sexual Selection...This depends, not on a

struggle for existence, but on a struggle between the males for possession of the females; the result is not death to the unsuccessful competitor, but few or no offspring." Darwin, C., 1859, page 88.

Horses (family Equidae) are part of the Order Perissodactyla, the odd-toed hoofed mammals (ungulates) that also include the modern families of tapirs and rhinoceroses. These odd-toed ungulates have either three toes or one toe on each foot, have a unique ankle structure, and digest their plant food in the hind-gut (in contrast to the rumen stomach in cattle). The fossil record indicates that the Order Perissodactyla extends back into the Eocene period. Over this time, several other groups of odd-toed ungulates, now extinct, existed throughout much of the northern hemisphere. One such group of extinct perissodactyls is the family Brontotheriidae, otherwise known as titanotheres, or brontotheres, the "thunder beasts." Brontotheres were the first fossil mammals documented from the western interior when in 1847 Dr. Hiram Prout published the description of a jaw (Figure 1) collected from the Dakota badlands (see Lanham 1973, pages 19-20).



Brontothere jaw from the Dakota badlands described by Dr. Hiram Prout in 1847 (from Osborn, 1929).

Brontotheres are first known from early Eocene deposits in North about 58 million years ago. During this time brontotheres were small and in many respects very similar in overall characteristics to their contemporary relatives, including primitive horses (like "eohippus"), tapirs, and rhinoceroses. After this time brontotheres underwent a fascinating diversification that resulted in several dozen species. Their low-crowned teeth indicate that brontotheres were probably browsers, eating soft, leafy vegetation. Several species of brontotheres also are found in Eocene deposits in Asia, indicating dispersal across the Bering land bridge that connected Alaska and Siberia during times of lowered sea level. During the later Eocene, about 35 to 40 million years ago, advanced brontotheres such as *Brontops* (Figure 2) evolved horns and attained very large size, rivaling the large rhinoceroses of the African savannas of today.

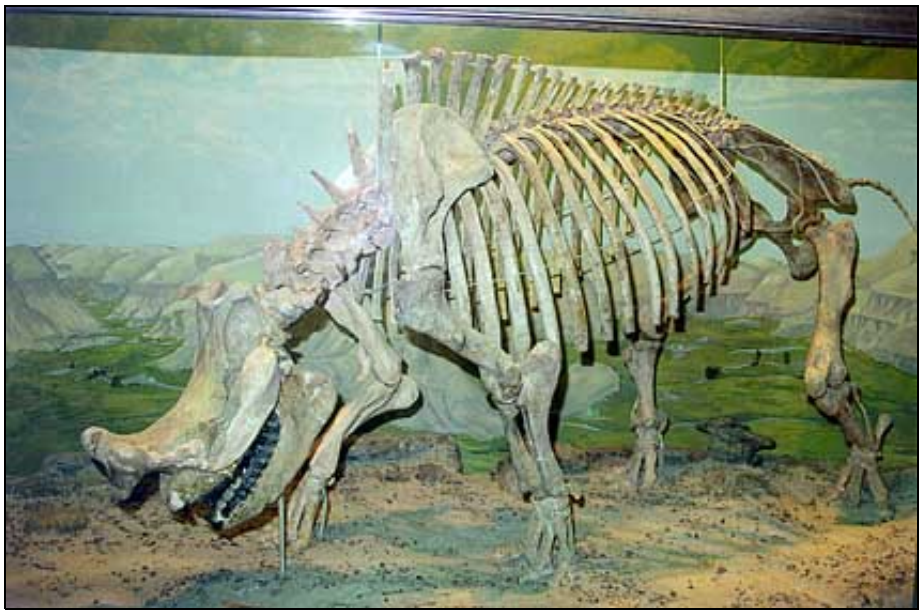


Figure 2. Skeleton of Brontops robustus *in the Museum of Geology, South dakota School of Mines. Erika Simons photo*

Although Darwin did not write about brontotheres when he published *On the Origin of Species* in 1859, he pondered the general adaptive significance of horns and antlers as they are elaborated in diverse groups of mammals (for example, in even-toed ungulates, the Order Artiodactyla, exemplified by deer, sheep, goats, and cows). Horns, like in brontotheres, are permanent structures, whereas deer antlers are shed annually. Darwin conceived of the idea of "sexual selection" in which males with large horns or antlers had an evolutionary advantage in both display

for a mate and during competition with rival males. In this context, the evolution of brontothere horns has fascinated paleontologists for more than a century. Brontothere horns had a massive bony core, but were also probably covered with a softer outer covering that did not fossilize. When horns are present in advanced brontotheres, both the males and females have these structures, although the male horns tended to be significantly more robust (or "dimorphic," meaning two shapes, one for the male and the other for the female) in the development of there structures. As Darwin noted, sexual selection tends to accentuate horns in the males, and an advantage is conferred to the larger more robust male, both for display and during combat. The evolutionary enigma, as evidenced by brontotheres, is how can sexual selection act when horns are very tiny, or rudimentary bumps, as seen in middle Eocene forms such as *Manteoceras* (Figure 3B)? Perhaps these skull thickenings originally evolved for another function (as yet unidentified), and secondarily became used for either display and/or fighting, at which time the evolution of there structures was accentuated in males by sexual selection.

Brontotheres have been used as evolutionary examples of Cope's Rule. Named after the famous 19th-century paleontologist Edward Drinker Cope (otherwise of dinosaur fame), Cope's Rule states that within an ancestral-descendant lineage there is a general trend towards increased body size in later forms. Certainly this is exemplified if one compared the early Eocene Eotitanops to the late Eocene Brontotherium in the idealized sequence depicted in Figure 2. Other fossil groups, like dinosaurs, marine ammonites, and even horses, have been used as examples of this evolutionary phenomenon.

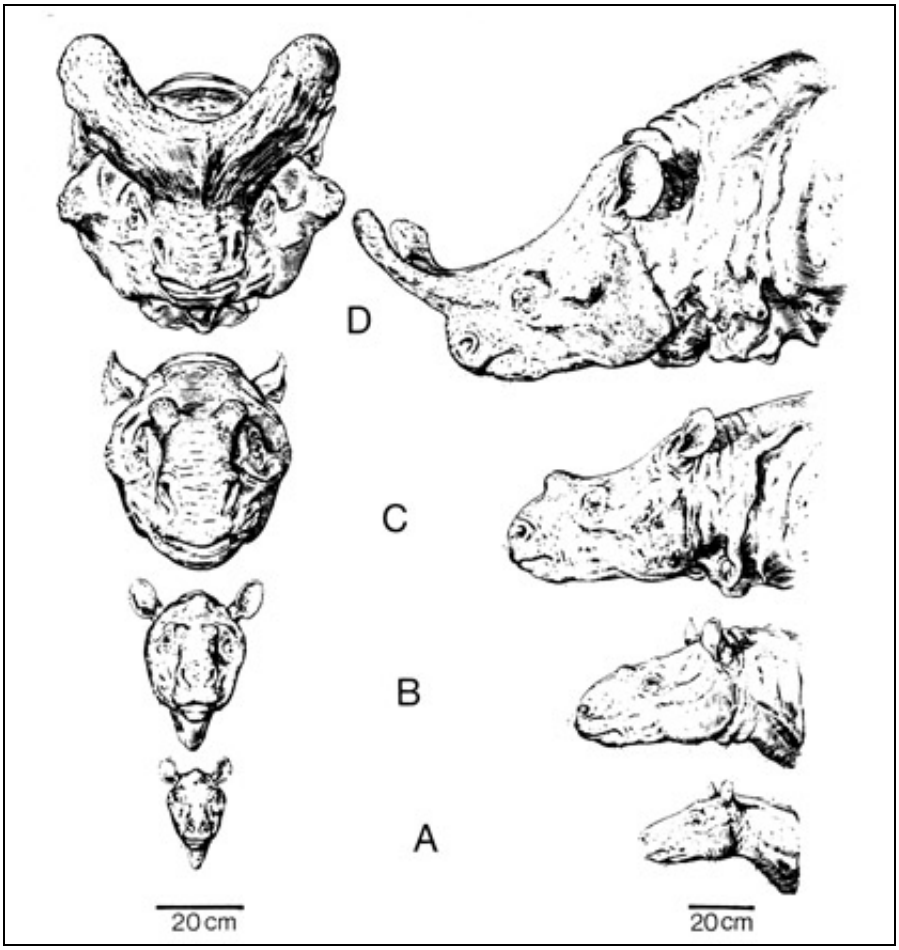


Figure 3. Evolutionary sequence of skulls of brontotheres (front view on left, side view on right), taken from the classic study by H. F. Osborn (1929, as modified by Stanley (1974). A. Eotitanops, *early Eocene, 55 million years ago.* B. Manteoceras, *early middle Eocene, about 50 million years ago.* C. Protitanotherium, *late middle Eocene, about 45 million years ago.* D. Brontotherium, *late Eocene, about 35 million years ago. This idealized sequence only contains a few examples of a much more complicated evolutionary radiation of the extinct perissodactyl family Brontotheriidae.*

Brontotheres are not known from Florida, but have been described from late Eocene sediments in Mississippi. By far the most common occurrences of brontotheres come from the richly fossiliferous Eocene sediments in the western United States, particularly in Nebraska, South Dakota, Wyoming, and Utah. In fact, early paleontologists found brontotheres so common in late Eocene-aged sediments (previously thought to be early Oligocene age) from this region that these mammals are the index fossil for the Chadronian land-mammal age, and hence the term "titanothere" (=brontothere of previous workers) beds. If you have ever been collecting in the titanothere beds, you undoubtedly experienced the plethora of brontothere bones that weather out of these ancient river and lake sediments. However, when one goes above the Chadron Formation into

the overlying, younger Brule sediments, brontotheres are nowhere to be found. Paleontologists therefore interpret the ubiquitous disappearance of brontotheres in North America above the Chadron and equivalent aged deposits in North America as the time when the thunder-beasts became extinct. The cause for brontothere extinction is still debated among paleontologists. Some believe that brontotheres were a victim of there own success and their larger more cumbersome bodies may have conferred an adaptive disadvantage relative to other mammals that competed in their ancient communities. On the other hand, a diverse array of evidence (see, for example, Prothero's 1996 book reviewed in Pony Express, vol. 9, no. 2) indicates that the late Eocene was a time of great global climate change, when in less than five million years, the Earth went from a tropical "hot-house" regime to the onset of an "ice-house" regime. Perhaps this dramatic climate change affected the brontotheres and ultimately contributed to their demise.

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(Bruce J. MacFadden)

Skeletons "Under Construction"

Start to finish - putting together a fossil skeleton is much more of an adventure than a project of selection and assembly. My husband, Steve, and I have been working on fossil skeletons since 1995. Starting with an Ice Age Horse, we have since sorted out by time, trial and experience some of the better techniques from those that leave one wondering - why did we do that?? There are many resources (books etc.) available to help get the job done but none will really do the job. Mostly it takes good skills (welding, sculpting, painting etc.) and a genuine interest. However, to make the whole plan work well, having a good working relationship with the people "in the know" aka as those great folks at the FLMNH, is essential.

This peccary skeleton shows seveeral of the stages involved in mounting

Every mount will be uniquely different and most seem to develop a life of their own, but all skeletons share the same beginnings and the odyssey for each one starts in the collections of Vertebrate Paleontology. Once we know which animal we will be working on we spend time with staff in VP working toward drawing together the fossils that will be used in the skeleton. The bones must be hand selected from the collection. Size, condition and other factors are considered when deciding which specimens will be used. It is ideal if the material comes from a single individual but that is rare, most often the skeleton will be

a fossil skeleton. The various shades on the bones represent original bone (dark) and reconstructed (lighter). The white ribs are "borowed from a recent domestic pig. The right front limb and rear limb show the closely fitted metal exoskeleton. Behind the skeleton is a life-sized drawing of the desired pose used in the finished pose. Suzan Hutchens photo

composed of elements from several different animals. Fossils in hand, the next step is to find the missing parts (those pieces that cannot be found in the collections), this stop is usually to a museum department that will have specimens we can use to compare the fossils with, like mammalogy or ornithology. Commonly we borrow an extant skeleton, which will either be cast for the missing parts or used as a model for sculpting. Occasionally it may be necessary to request a loan from another museum to get what we need to work with.

With all the materials assembled, we now can begin the task of reconstructing the missing parts. This means repairing bones where needed, sculpting and casting the missing sections to flesh out the full skeleton, this is perhaps the most time consuming part of the project, and the most tedious. During this phase we draw on all of the resources we have on hand, (pictures, reference and comparative material etc.). Occasionally we need to consult with museum staff with a question about shape, form or function. When the skeleton is fully prepared we position the bones (using a sketch the museum has chosen) and make a to-scale drawing from them. At this juncture we consult with the museum and they evaluate the drawing before finalizing the pose that we will use to articulate the mount.

Now fully prepared, the bones are ready to move to the welding shop and there they can be fitted for what we call their "exoskeleton". There are several methods that will hold the bones together, but usually the framework is either inside or outside of the bones. We use external support (where possible) for several reasons; internal mounting can cause more harm to the fossils, by breaking or drilling big holes. Also it may cause the loss of valuable data by altering the length or dimensions of the elements and sometimes this method can restrict access to individual elements. For these reasons we try to use external framing, which leaves the bones intact and makes it easy to remove them.

The task in the shop is to design the structure that will hold up the skeleton during the articulation. This requires a bit of welding and a little hair loss. The next step (more hair loss), is, fabricating the "form-fitting" metal rods. They are made to look as if the steel has melted onto the bones. Small custom fittings are then welded to the rods. The bones receive "sockets" that hold the rods in place, each one is individually turned and drilled on the lathe and then tapped for machine screws. These small cylinders or sockets are then placed into pre-drilled holes in the bones. Small screws can then connect the rods (through the fittings) to the bones. This method allows for minimal intervention and will hold the bones securely with few attachments. The entire process is very time consuming and has "lots" of starts and stops, but it is a wholly rewarding endeavor (forgetting the hair problem). When the skeleton emerges from the shop it usually needs little more than some paint (to blend repaired and cast parts), some minor assembly and a new home.

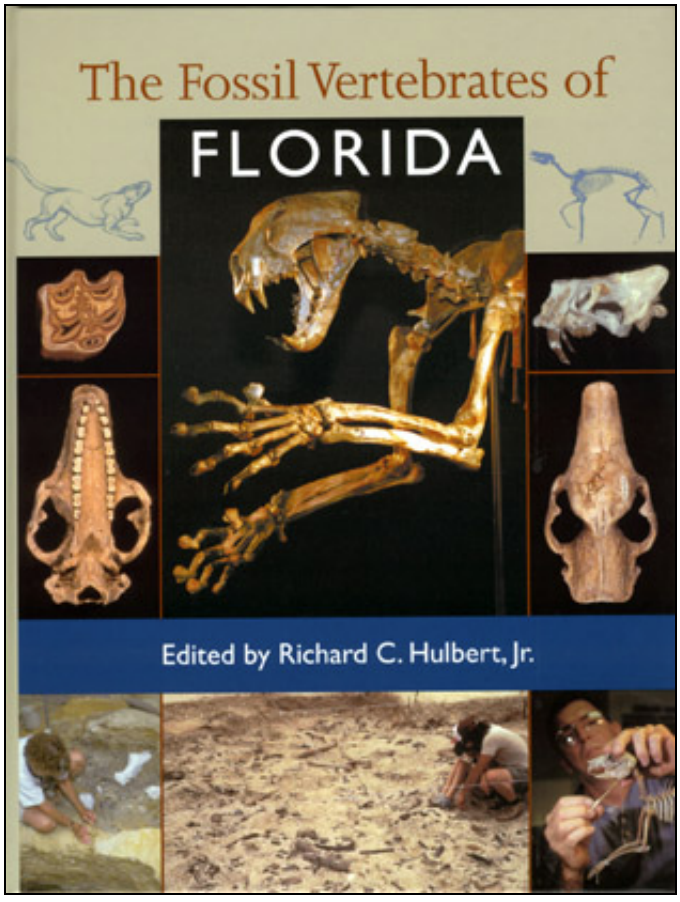
The purpose of this writing was not to fully explain any aspect of skeleton building. The intent was to touch on some of the things Steve and I have done in the process of getting from a box of bones to a fully articulated skeleton. We have had the wonderful opportunity to see a number of skeletons take shape and learn about each one along the way. Working on fossil skeletons continues to be a great experience...a brain-stretcher for sure, and we just love it!
Suzan Hutchens

Homeschooling Groups Request More Family Days at Thomas Farm

This will be the third year that *Pony Express* has offered Family Day at our ThomasFarm fossil site. This informal paleontology field trip was especially designed for groups of children (ages 8-15) and their parents or guardians. The small group of about twenty people arrives at our 18-million-year-

old Miocene fossil site at 9:00 a.m. and after a short talk about the history and ecology of the site, the group sets out to find fossil treasure in our spoil piles. Armed with a list of fossil species and a couple of handouts on horse skeletons, the diggers learn what kind of bones they find and how the animals may have lived so many eons ago. After a bag lunch and a cool drink the group goes on a short nature walk around the picturesque perimeter of the site. Upon their return they continue to hunt fossils or participate in an optional activity of sorting through screen-washed, fossil-rich matrix to find tiny rodent teeth and toes, frog parts, bat teeth, etc. The day winds down at 4:00 p.m. when everybody leaves pleasantly tired from an exciting day in the field. Family Day is normally scheduled for once a year in early May. After the first Family Day I received a call from a homeschooling mother who wanted to schedule another Family Day just for her group. We worked out a time that suited the group and the result was a wonderfull experience and a lot of happy students. Since that time we have received more requests from homeschoolers and gifted class groups from public schools for custom scheduled Family Days. This increased interest inspired *Pony Express* to run more Family Days on a customized basis. Interested groups should plan their trips several months in advance. Each child must be accompanied by a parent or guardian. The group limit is about 20 people, including adults. All requests should be sent to Erika Simons at:
esimons@flmnh.ufl.edu
or mail to:
Florida Museum of Natural History
University of Florida, Powell Hall
P.O. Box 112710
Gainesville, FL 32611-2710

Book review: *The Fossil Vertebrates of Florida* Edited by Richard C. Hulbert, Jr.



University Press of Florida, Gainesville, 2001, 350 pages, hardcover, ISBN-0-8130-1822-6, list price $39.95.

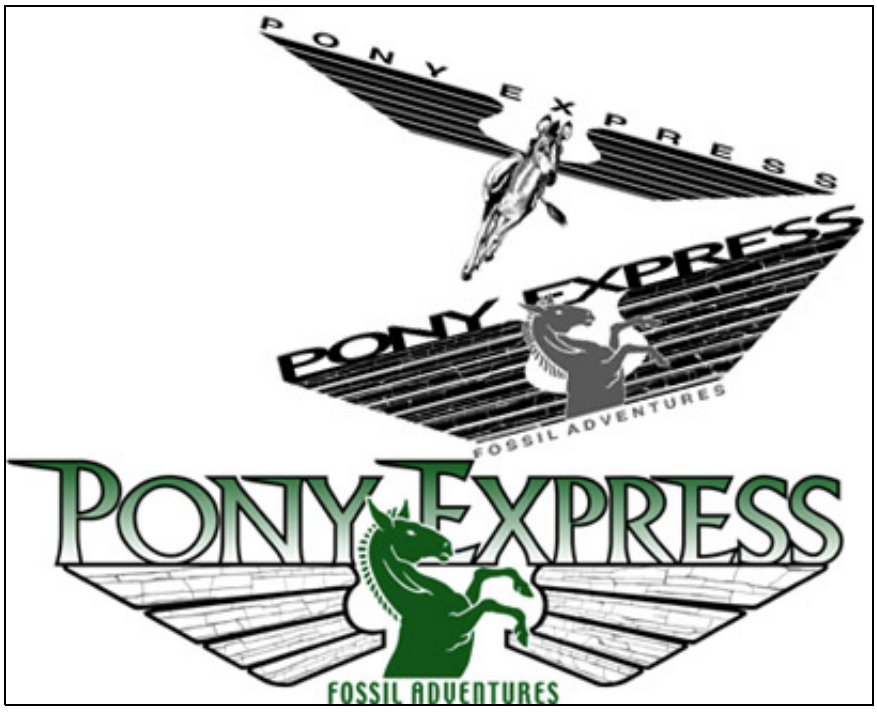
From 1967 until the mid 1980s the Florida Paleontological Society published a series of pamphlets called the *Plaster Jacket*. This series dealt with a variety of topics related to Florida fossils, ranging from sharks to mammals. Taken together, the range of subjects contained in the *Plaster Jacket* served as an authoritative basis for our understanding of Florida paleontology, particularly for commonly encountered vertebrate fossils.

Dr. Hulbert, a recognized expert on Florida fossils and currently VP Collection Manager at the FLMNH, has taken the *Plaster Jacket* series and subsequent papers (e.g., an updated version of "Checklist of Florida's Fossil Vertebrates," originally published in Papers in Florida Paleontology, no. 6, 1992) and combined these into *The Fossil Vertebrates of Florida*. He is listed as the Editor of this volume; however, to say that he merely "edited" these chapters from the previous versions is quite an understatement. Hulbert has spent an immense amount of time updating and integrating the original Plaster Jackets into the current book chapters. In places he has done extensive revisions based on new research and

discoveries. In other places he has entirely written new sections that fill in those topics not covered in the original pamphlets. The references are updated and now comprise an extensive list of essentially all relevant scientific papers on each subject. Most of the original figures are redone from the original or they have been updated from more recent scientific work. Hulbert also has taken many new photographs of important fossil specimens. The book is clearly written, well organized, abundantly illustrated, and attractively presented.

The Fossil Vertebrates of Florida unquestionably represents the current authoritative and state-of-the-art synthesis of our knowledge of Florida vertebrate paleontology. It will have broad appeal to both the professional and enthusiast and will serve as an oft-cited reference for many years to come. This wonderful book is sure to be a classic work in the field of Florida paleontology.
Bruce J. MacFadden

Introducing A New Logo For *Pony Express*'s 10th Anniversary



Much thought went into the developement of this logo. Here are two of the preliminary sketches next to the final logo. Merald Clark illustrations

Logos evolve through the years and the *Pony Express* is no different from a corporation or an institution that wants to change or update its "image." In the early days of the *Pony Express*, the running horses in the original logo were borrowed from images of *Equus* produced by the Los Angeles County Museum. Now in its 10th year, the *Pony Express* has grown past our initial expectations, and we begin the second decade of the *Pony Express* program with a new and improved logo. This logo was designed by Cyndi Moncrief and Merald Clark, avid Thomas Farm diggers. The ideas behind the new logo are as follows: After 10 years of using a Pleistocene *Equus* species from the La Brea tar pits, we thought it was time that our logo reflected more of the time period on which our fossil horse program concentrates. The small, three-toed horse depicted in the new logo represents most of the fossil horses we find both at our Miocene fosil site, Thomas Farm, and in Western Nebraska in Oligocene sediments. The wings of the horse hold a two-fold meaning. They represent a sinkhole in cross section with sedimentary strata, a direct reflection of the Thomas Farm site, while also representing rapid communication, as the galloping horses or the *Pony Express* did in the 19th century. We thank Cyndi and Merald for their creative vision and the dynamic new logo for the *Pony Express*.

Pony Express

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Pony Express--Statement of Purpose:

The purpose of this newsletter is to communicate news and information and disseminate knowledge about fossil horses, particularly in Florida, and to develop a state-wide constituency that will support and enhance the research, exhibition, and educational programs offered at the FLMNH that pertain to fossil horses. Contributions to the Fossil Horse Fund are deposited into an account at the University of Florida Foundation, Inc., a tax-exempt entity, and will be used for the purposes stated here.

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