

Florida Fossil Horse Newsletter

Volume 1 Number 4 4th Quarter 1992

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Editor's Preface to 4th Issue

This completes the first volume of *Pony Express*. The response from fossil horse enthusiasts throughout Florida, as well as around the United States and other countries, has been extremely enthusiastic. Much of this year has been spent getting the newsletter and related activities off the ground and stabilized financially--these goals have been accomplished. We now have a standard format for the newsletter, an official logo (above), and a viable readership to make things work. Although we are pleased with our publication, *Pony Express* is also your newsletter and we welcome further suggestions from you. For example, the article on *Mesohippus* in this issue was written because one of our readers asked "why don't you tell us about the oldest fossil horse from Florida?"

During our first year we had two very successful digs at Thomas Farm with the participation of many of our *Pony Express* supporters. We plan to have more digs in the future. Other activities (workshops and lectures) also are being planned and these will be announced in upcoming issues of *Pony Express*. We also are available to give lectures around the state if your fossil club or local organization is interested in learning more about fossil horses.

We have spent much time this year traveling throughout Florida and talking to interested persons about *Pony Express* and related activities. There has been enhanced communication and mutually beneficial networking with other fossil organizations and clubs in Florida that can serve as a model for similar programs elsewhere in the United States.

There are many people that made the first year success. First and most importantly, I thank Linda Chandler for all of her help with the newsletter, managing correspondence and finances, interfacing with the printers, etc. The beautiful newsletter is largely a result of her efforts and expertise! I also thank Dan Cordier whose enthusiasm, charisma, and "can do" attitude has done much to help the success of *Pony Express* activities during this year. I also thank the many volunteers who spent over 250 hours this year helping with mailing and other important jobs. And last, but certainly not least, without the interest and support from the readers, there would be no *Pony Express*. To all Charter Members--thank you.

Early in 1993 all Charter Members will receive a custom-printed *Pony Express* binder to keep your newsletters in and subscriptions/contributions announcements for the upcoming year. The next issue (Vol. 2, No. 1) will be sent out in March. We encourage you to continue your support of *Pony Express* during its second year. Someone asked me "how long can you write about fossil horses?" The answer is simple: I barely have enough space in each issue to include everything I want to write about. And, while I'm writing, I'm always thinking about more exciting and interesting articles to write about in future issues! (Bruce J. MacFadden)

Save your copies of *Pony Express*!

During early 1993 each Charter Member will receive a special custom three-hole binder with the *Pony Express* logo printed on it. These will be sufficient to hold the first five years of your issues of *Pony Express*. Charter members are defined as those members who subscribe to the *Pony Express* during 1992. If you know someone who is interested in subscribing, but has not yet sent in their contribution, encourage them to do so soon. New members will receive all back issues of Volume 1 of the newsletter. A list of Charter Members will be published in Volume 2.

Prep Talk

Patience is the ally of a good preparator. There simply is no quick or easy way to produce a high quality specimen. However, by investing the necessary time and following a few common-sense rules of preparation, you can produce your own quality specimens.

If your fossil was collected in a plaster jacket, *prepare* it in the plaster jacket. The normal procedure of preparation is to remove matrix from the top and sides of the specimen, hardening the bone as the matrix is removed. When this stage of preparation is complete, about one half of the specimen will have been prepared. At this point, the specimen *should not* be removed from the jacket. The top side of the specimen facing you may look deceptively sturdy and you may be tempted to pull it out. If the fossil is removed at this point, more often than not the bottom half of the specimen will be left in the jacket, necessitating a major repair job. A wiser course of action is to cut the sides of the jacket down, cover the prepared part of the specimen with paper, and make a thin plaster jacket over this half of the specimen (the jacket must be strong enough to support the specimen when it is turned over). When the new jacket is hard, the specimen can be turned over and the remnant original jacket may be removed carefully. Caution is advised here because pieces of a fractured specimen may cling to the original jacket. When the old jacket has been removed, the side of the specimen now facing you can be prepared and hardened just as the first side was. When finished, the specimen will be cleaned, prepared, and hardened on both sides and can be removed safely from the jacket.

Next time I'll discuss filler materials for reconstructing and strengthening the missing portions of your specimen--which materials to use, how to apply them, and where to get them. Any questions

the reader may have about preparation, conservation, or moldmaking will be answered by writing to:

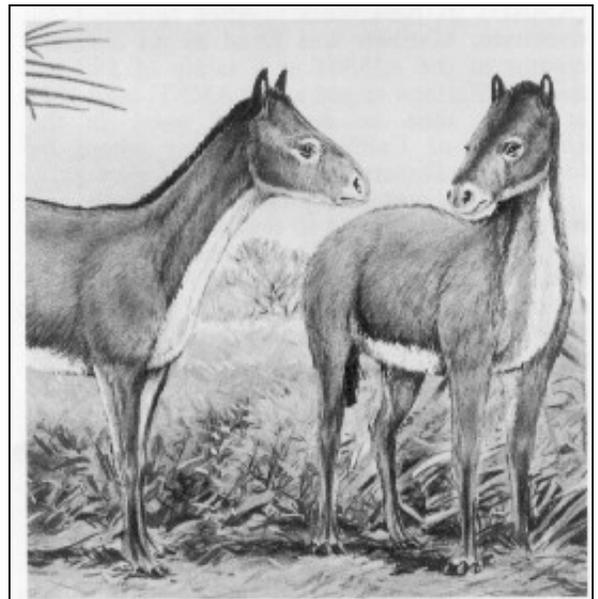
Russ McCarty, c/o Pony Express or by calling (352) 392-6767. (Russ McCarty)

Fossil Horse Spotlight--*Mesohippus*, the earliest fossil horse in Florida

Although *Hyracotherium* (previously called *Eohippus*), the oldest fossil horse known to paleontologists, is about 55 million years old, fossil horses did not appear in Florida until some 30 million years later. This is because, as far as we know, most of the Florida peninsula was under water before 25 million years ago. It is not until the late Oligocene that we begin to have the first record of land mammals, including horses.

During the mid-1960s the interstate 1-75 was built through northern Florida. When an exit ramp was excavated just south of Gainesville, tiny fossil bones were uncovered and brought to the attention of the paleontologists at the Florida State Museum. This small outcrop produced several hundred specimens, mostly of sharks and bony fishes. Along with these marine vertebrates, some small land mammals also were recovered. These included marsupials, bats, rodents, rabbits, carnivores, artiodactyls, and the first record of horses from Florida. This fossil assemblage since has been termed the "I-75" locality. Based on comparisons with mammals from elsewhere at a similar stage of evolution, the 1-75 land mammals are of late Oligocene age and are the earliest land mammals known from Florida. Some of the best comparisons can be made with similar fossil mammals from the western United States, including the classic Oligocene Big Badlands in South Dakota.

The fossil horse specimens from 1-75 are few in number and quite fragmentary. Nevertheless, several of these fossils are highly diagnostic. The teeth are low crowned without cement and the molars are advanced over Eocene horses. With these and other characters we are able to identify the 1-75 horse as *Mesohippus*, a genus that is exceedingly common throughout many fossil localities in the western United States. *Mesohippus* had a low-crowned dentition, probably fed on a generalized diet of various plants, and had three toes on each limb. It was about the size of a collie, which is small by today's standards. This glimpse of the oldest known horse in Florida is very important because it sets the stage for a quite different story during the Miocene. During the Miocene, horses underwent an adaptive radiation that resulted in many different species. These are very common in numerous fossil sites of diverse ages throughout the state until about 10,000 years ago, when horses became extinct in Florida.



Reconstruction of Mesohippus, reproduced courtesy of R. J. G. Savage.

(Next time: Ancient browsing horses from Florida)

Famous Horseologists--William Diller Matthew (1871-1930)

(I am indebted to Edwin and Margaret Colbert for providing details about Dr. Matthew and for wonderful anecdotes about what kind of person he was. Also see Book Review section below.)

Few paleontologists have had such a profound influence on the study of North American fossil mammals as did William Diller Matthew. Canadian by birth, Matthew left his country to pursue graduate studies in geology at Columbia University in New York, where he received his Ph.D. in 1895. Although originally interested in many facets of geology and paleontology, he was influenced by the great paleontologist Henry Fairfield Osborn, who had just come to Columbia both to begin a program in geology and biology and to start a collateral program at the American Museum of Natural History (AMNH) in New York. After receiving his doctorate, Matthew was hired as an assistant curator at the AMNH at a salary of \$80 per month. Matthew stayed at the AMNH until 1927 at which time he was lured away to the University of California, Berkeley where he founded the Department of Paleontology.



Matthew was a very careful, thorough, and highly respected (even to this day) specialist on various aspects of fossil mammals of different ages from throughout the world. As historian of science Ronald Rainger noted, Matthew was viewed by the establishment (including his mentor Osborn) as a "young Turk" because he was so well trained in stratigraphy and geology in contrast to some of the old Guard. Matthew also was notable in that he did extensive fieldwork himself, rather than only sending out collectors into the field, which was a common practice at that time. While at the AMNH, Matthew always was well dressed, hard working, and loved to smoke cigars. In a letter to MacFadden dated 6 March 1992, E. H. Colbert wrote "There used to be a legend at the AMNH that if you looked into Matthew's office and saw a dense pall of smoke, he wasn't there, but if the smoke was rolling around, he was in the middle of it."

William Diller Matthew, photograph of sculpture done by his daughter, Margaret Matthew Colbert (courtesy of Mrs. Colbert).

As mentioned above, Matthew made major contributions to the knowledge of many aspects of fossil mammals, including taxonomy and phylogeny, important descriptions of extinct faunas, and pioneering work on the influence of climate on evolution. Because of their excellent fossil record, Matthew wrote many important papers on the evolution of horses. For example, in 1926 he realized that the tiny three-toed *Nannippus* was a distinct genus. Another of his lasting contributions was the classic 1926 article in which he brilliantly illustrated the evolutionary stages depicted by fossil horses from North America. Another was his popular 1930 article where, for one of the first times, the horse family tree was depicted with all of its "bushiness." This complexity was in contrast to the straight-line phylogenies proposed by many 19th century paleontologists (e.g., the Yale professor Marsh). In summary, Matthew made immense intellectual contributions to the study of fossil mammals, and in particular horses, that still are of great relevance in modern studies.

(Next time: C S. and M. Johnston: Unsung heroes and heroines)

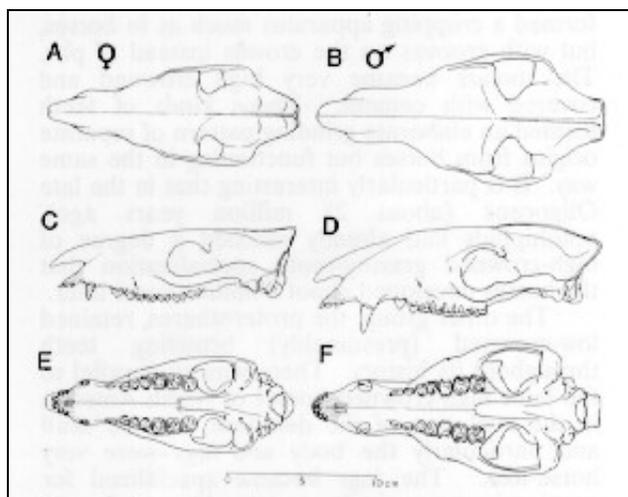
Variation: Sex in Fossil Horses

(After reading Pony Express No. 3, one reader wrote to me and said that they couldn't wait to learn about some saucy details of sex in fossil horses. I don't want to disappoint the readers, but I hope that you will find this article of interest.)

The sex of mammals can be determined by numerous characters, some that fossilize and others, such as soft anatomical structures, that do not. All of these are called "secondary sexual characteristics." A good example of parts that do fossilize in mammals are the antlers of some male

artiodactyls (e.g., deer), whereas the females are antlerless. Also, in many mammals there is a size difference between the males and females of a species--this is called sexual dimorphism. The rule for mammals is that, generally, males are larger than females. There are exceptions, however, where females are larger than males (e.g., in some bats). Nineteenth-century paleontologists were less aware of sexual dimorphism in fossils. As such, they oftentimes described separate species for what we now believe to be males and females of the same species.

Interestingly, in well-preserved quarry samples of fossil horses we can see evidence of both secondary sexual characteristics and sexual dimorphism and how these evolved through time. One of the best examples of this comes from the earliest horse, *Hyracotherium*. In the 1950s George Simpson and George Whittaker from the American Museum of Natural History collected a large sample of *Hyracotherium* from the Eocene of Colorado which contains about 24 individuals of the more common species *H. tapirinum*. Subsequent study of this "paleo-population" by Phil Gingerich indicates that the males can be identified by their relatively larger canines and the fact that their skulls are about 15% larger than those interpreted to be females (see figure). These results are very interesting because they demonstrate that sexual dimorphism was more pronounced in the earliest horses than in modern *Equus*. Although males and females of modern horses can be told apart by the size of their canines, there is little body size difference between the sexes.



Dorsal, lateral, and ventral views of females (left) and males (right) of *Hyracotherium* from Colorado,

interpreted to be females (see figure). These results are very interesting because they demonstrate that sexual dimorphism was more pronounced in the earliest horses than in modern *Equus*.

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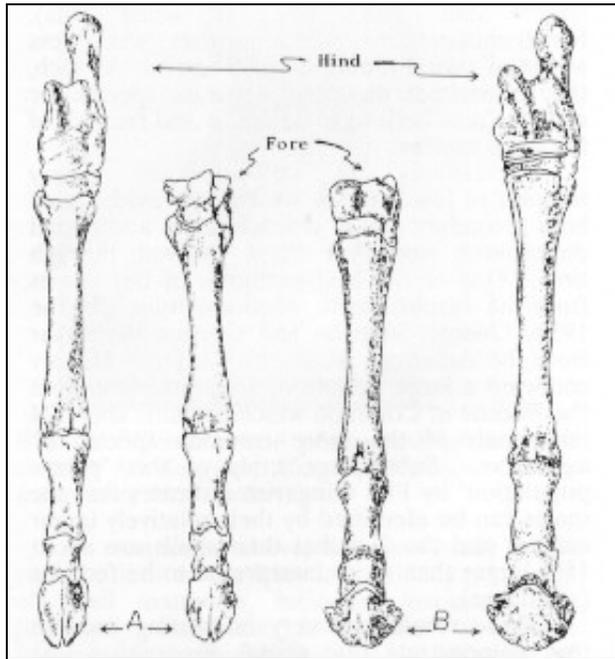
When the sex of individuals can be determined from fossil quarry populations, interesting speculations can be made about their ancient biology based on modern analogues. For example, Gingerich speculated that *Hyracotherium* lived in small herds called "harems") consisting of a dominant male, several females, and their offspring. These harems probably occupied small territories and fed upon a variety of plant foods. Thus, determination of the sex of individuals, and relative proportions of males and females in a paleo-population can allow a better understanding of the ancient biology of fossil horses.

(Next time: Geographic variation)

Pseudo-Horses

by Dr. Atta Y Sobh, Professor, Geology Department, American University of Beirut, Lebanon

There formerly lived two groups of mammals in South America, the notohippids and proterotheres, which are referred to here as "pseudo-horses." As we will see, they were not even closely related to horses other than the fact that they all are placental mammals. However, all of these groups went through some similar evolutionary stages. Starting from other mammalian ancestors that were very distinct from early horses, these South American groups evolved some of the same adaptations that are seen in various lines of horses. They provide an interesting comparison with how horses evolved, and they also pose some special puzzles. Comparison of their history with that of horses contributes greatly to an understanding of evolution in general. The history of the South American "pseudo-horses" is a long and different story, but some of its main points will be mentioned briefly in this article.



Feet of Thoatberium (A), a one-toed Miocene South American proterothere, and Equus (B), a true one-toed horse. (not to scale)

When the pseudo-horses developed, there were no horses in South America. South America still was an island continent that horses did not reach. In the absence of horses, the pseudo-horses filled similar niches in nature. This sort of adaptation is called parallel evolution, and this has occurred many times in many different groups of animals and plants.

High-crowned teeth, presumably for grazing, were developed in the notohippids. The incisors formed a cropping apparatus much as in horses, but with grooves on the crowns instead of pits. The molars became very high crowned and covered with cement. These kinds of teeth formed an elaborate grinding pattern of separate origins from horses but functioning in the same way. It is particularly interesting that in the late Oligocene (about 25 million years ago), notohippids had already reached a degree of high-crowned grazing-tooth specialization that the horses developed about 8 million years later.

The other group, the proterotheres, retained low-crowned (presumably) browsing teeth throughout its history. There was no parallel to the later high-crowned horses of North America in the evolution of the dentition, but the skull and particularly the body and legs were very horse-like. The legs became specialized for running in a way similar to later horses. In one line, three toes were retained, as they were in the hipparion horses, with a large middle toe and reduced side toes. Another line became one-toed, as in the *Pliohippus-Dinohippus-Equus* line of horses. Side toes in South American proterotheres were reduced to mere bony nubbins, whereas in *Equus* these structures still are represented by rather long splint bones. These proterotheres and the horses are the only truly one-toed mammals known to paleontologists. The proterotheres reached the one-toed stage at the beginning of the Miocene (about 20 million years ago). Another interesting point is that despite these evolutionary specializations, these one-toed proterotheres never became very diverse, as did the horses in North America. They are also interesting because they present a combination of foot and tooth types that never developed in the horses: They were one-toed browsers. In contrast, horses include three toed browsers, three toed grazers, and one-toed grazers, but no one-toed browsers. In summary, comparisons with the pseudo horses of South America and the true horses of North America illustrate several interesting aspects of parallel evolution and adaptation by mammals living on different continents.

Readers' Forum
From a Thomas Farm dig--

Dear Bruce,
 ...The dig was a great experience and I look forward to incorporating it into my [school] curriculum this year. I gave a little blurb about it at our pre-school conference and more interest was generated.... Take care, and say "hi" to Dan, Russ, and Art!! Bonnie Mizell, Orlando.

Book Review

William Diller Matthew, *Paleontologist: A Splendid Drama Observed*. 1992. ISBN 0-23107964-8. Published by Columbia University Press, New York. Single copies can be ordered from your local bookstore or contact Publication Sales, Columbia University Press, 136 South Broadway, Irvington, New York 10533, 1-(800)944-8648, hardcover--\$45.00 (add \$3.00 shipping if ordering directly from Columbia University Press).

As mentioned above (see Famous Horseologists), William Diller Matthew was one of 'the most influential paleontologists of this century and made lasting contributions to many aspects of the study of fossil mammals. In this book, written by the famous vertebrate paleontologist in his own right, Edwin H. Colbert, we learn about the life, travels, and scientific contributions of Matthew. The book is quite handsome indeed (with a wonderful photo of Matthew on the cover). It is written in a very inviting yet authoritative style, and the text is punctuated by many letters and photographs.

It is easy to understand paleontologists' science by reading what they have written. However, it is more difficult for us to know what kind of life these people lived, particularly for those who are long gone. In addition to gaining insight into Matthew as a scientist and a family man, the book tells a wonderful story about other paleontologists who interacted with Matthew; it also tells of his many travels around the world and his numerous and exciting fossil discoveries, including many fossil horses. Colbert's book is highly recommended for anyone with an interest in what it was like behind the scenes, so to speak, in the life of one of the great paleontologists of the 20th century.

5th Converse Award to Ben Waller

The Howard H. Converse Award was established in 1988 by the paleontology division at the Florida Museum of Natural History to recognize outstanding fossil collectors in Florida. Previous recipients have been Rick Carter ('88), Evelyn and Ernest Bradley ('89), Lelia and William Brayfield ('90), and Phil Whistler ('91). The FlaMNH is delighted to announce that this years' recipient is Ben Waller of Silver Springs (see photo).

During a span of five decades, Ben has made major discoveries in both Florida archaeology and paleontology. He has been a leader in underwater collecting. His fossil discoveries are far too numerous to mention individually. His more spectacular finds include the giant flightless bird *Titanus* (named *walleri* by Pierce

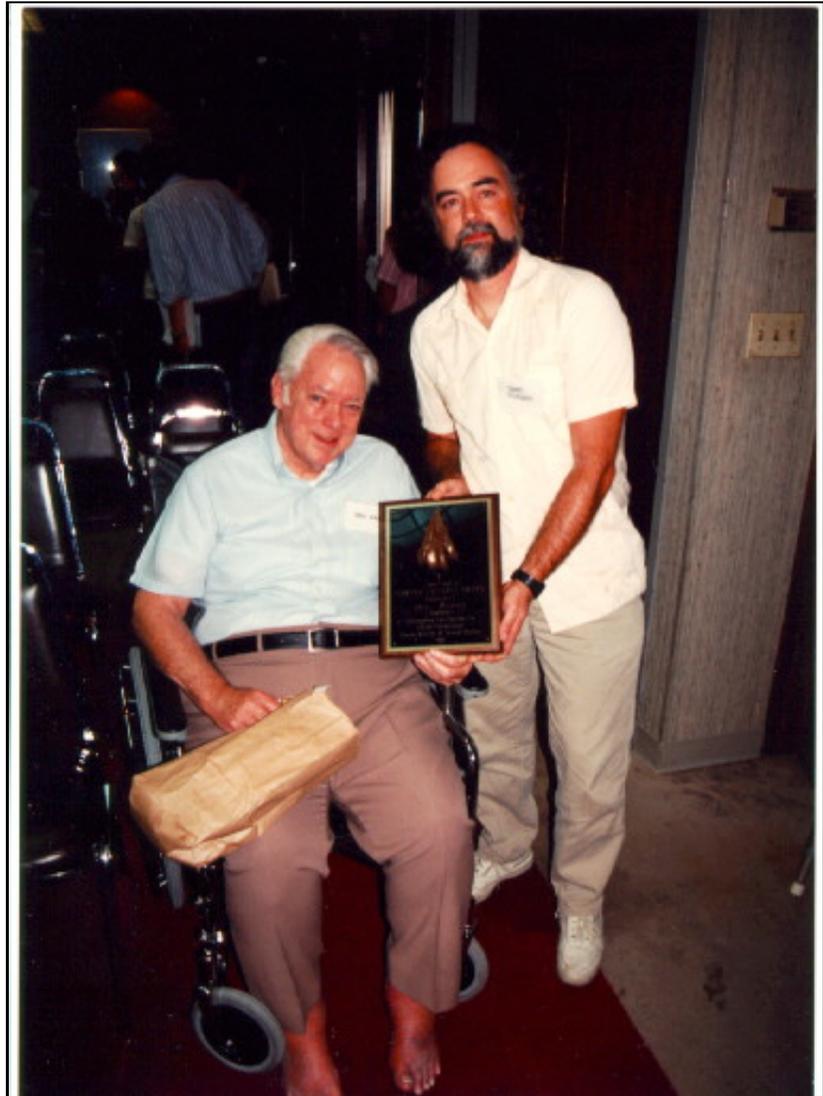
Brodkorb) and the mammoth spine which has evidence of butchering by early inhabitants of Florida. Many of Ben's river collections have included important horse specimens, including extinct Equus. We applaud Ben's contributions to Florida paleontology and believe that he is a most worthy recipient of the Converse Award.

Pony Express

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*Ben Waller and Gary Morgan during presentation of Converse award
at the Florida Paleontological Society meeting in Barlow.
(photo courtesy of Tom Harrigan)*

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Fossil Horse Fund

and sent to the Managing Editor, at the address listed above.

Statement of Purpose:

The purpose of the letter is to communicate news and information 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 FlaMNH that pertain to fossil horses. Contributions to the Fossil Horse Fund will be 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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