



## Florida Fossil Horse Newsletter

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### Always something new and interesting at Thomas Farm

Most first-timers at a fossil dig are happy if they find a few loose fossils to put in their bag. A toe bone or vertebra whets their appetite to continue on for a complete tooth or a nice leg bone. To hope for a jaw or a skull is usually something they associate with experienced diggers and therefore out of their realm. Call it beginner's luck or what you will, but at Thomas Farm it isn't that unusual for a first-time fossil digger to make a big discovery.

On her first Thomas Farm dig in April 2001, Suzanne Johnson of Archer made a plaster jacket of what seemed to be a well-preserved fossil. However, it is always difficult to judge how complete the fossil specimen is until it gets back into the laboratory. Back in the museum Russ



*Suzanne Johnson holding the prepared skull of the three-toed Parahippus leonensis that she collected during the 10th Annual Thomas Farm Spring Digs. The beautifully preserved teeth are to the left and the back of the skull is to the right. Erika Simons photo*

McCarty and his prep folks patiently removed the 18-million-year-old sandy matrix containing the fossil. There was considerable excitement with Suzanne's discovery because once prepared, this fossil represented a particularly well-preserved skull of the three-toed horse *Parahippus leonensis*, one of only a half-dozen collected over the many years of digging at Thomas Farm. The preservation of this skull is very good, with the brown fossil bone and darker brown teeth (photo). Based on the wear in the teeth, this individual was a mature adult, probably about five years old when it died and then became fossilized. Although *Parahippus leonensis* is the most common fossil encountered at Thomas Farm, the discovery of a beautifully preserved horse skull like this one is cause for celebration. Thanks to Suzanne for her discovery. This specimen will be gladly catalogued into our collections for future study.

Suzanne Johnson is UF's Director of the Center for Pediatric Psychology and Family Studies. She is currently on a year's sabbatical in Washington DC, where she is a Robert Wood Johnson Health Policy Fellow working in the office of Senator Hillary Rodham Clinton. Luckily she came home for the holidays, so she could pose with her *Parahippus* skull discovery and be featured in this Pony Express issue!

(Bruce Macfadden & Erika Simons)

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### **UF paleo Student Profile: Dana Ehret**

Dana Ehret is a first-year graduate student in the UF geology department, working with professor Bruce MacFadden. Dana received his undergraduate training at Stockton State in New Jersey where he pursued his interest in vertebrate

paleontology and reptiles. For his Master's research at UF, Dana will study the ubiquitous fossil tortoises from the Nebraska badlands. Through carapace measurements and cutting thin-sections of the tortoises limb bones, he hopes to get a reasonable estimate of the ages of individuals at the time of their death. The limb bones record growth lines much like the annual growth rings of tree trunks. These data will be useful in reconstructing the population structure of these interesting denizens of the Nebraska badlands 33 million years ago.



*Dana Ehret picks apart the hard siltstone matrix from inside a tortoise shell to find limb bones inside. Erika Simons photo*

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## The Tiny Fossils of Thomas Farm



*Skull of Oligobunus Floridanus (dorsal and occlusal views) from Thomas Farm. Erika Simons photo*

*Editor's note: Many of the participants at the Thomas Farm fossil digs are teachers who bring what they have learned back to their classrooms in some form or another. Griff Jones, a science supervisor and teacher at PK Yonge Laboratory School in Gainesville, created a 'school-yard fossil pit' with the help of the Florida Museum of Natural History, that became the focus of several science labs in that school (see Pony Express, vol.6, no.1). After learning of Griff's idea, another educator and participant, Paulette Stone of Orange County High School, implemented this same idea in her school with great success. Beverly Rawlings teaches science to the 7th graders of Apopka*

*Middle School, Apopka , FL. She has participated in the fossil digs at the University of Florida's eighteen-million-year-old fossil site, Thomas Farm in Gilchrist Count, Florida. For the past four years, Beverly has been taking a small sample (about a 2-gallon bucket) of the spoil from her one-meter square back to her classroom, where she holds a science lab in paleontology with her students. The lab stirs the scientific interests of the students as they make their own discoveries. This fall, Gary Morgan, Curator at the New Mexico Museum of Natural History, returned to Thomas Farm, where he had spent many years digging and studying fossil bats, to collect more matrix for his continuing research. The tiny fossils discovered by 7th graders of Apopka Middle School may prove important contributions to this ongoing research.*

When Sunday morning arrived on my first year of digging at Thomas Farm and we were packing up to leave, I finally asked the project director, Dr. Bruce MacFadden, if I could take a bucket of sand from the spoil pile so that my students could sift through it and see what they could find. He approved my removing the material and I filled several small boxes. That first year, I made sure that I was taking sand from the spot on the pile where I had emptied my bucket. I wanted to be able to tell the students that this came from the very spot where I worked.

When I got back to Apopka, the sand was transferred into a five-gallon bucket and was tucked into the back corner of my supply closet. The school year was almost over and there was no time to fit in the kind of lab I wanted the students to do. It had to wait for the next year.

It was with some trepidation that I pulled out the sand the next year. After all, I was not certain that my students would be able to find anything. The sand was very fine and I was afraid that it contained only tiny fragments of bone that the students would get bored with in a very short time. I need not have worried.

The first day of working with the sand, every child had found some bone and there were more than a dozen tiny complete bones. It was the second day, however, that brought the real excitement. For more than the fiftieth time that day, I heard someone call out, "Look at this, Mrs. Rawlings!" and I turned to examine the 'find'. "It looks like a comb," the student told me. You couldn't have proved it by me. All I could see was a dark speck. The student was very excited, so I placed the speck on a white background and placed it under the dissecting microscope we were using. To my amazement, it was a section of jaw with six jagged teeth! We photographed it and carefully placed it in the gelatin capsules we used that first year to hold our best fossils. The next year, Bruce identified our treasure as an anole jaw.

That jaw fragment was the best find that first year, but there were many other exciting teeth and bones. Students found tiny molars, rodent incisors, metacarpals and metatarsals. No student was disappointed in what he or she had found.

Since that year, the students of the Leopard Team at Apopka Middle School have sifted through the fossil-rich matrix from Thomas Farm. They have photographed and tried to identify the tiny fossils that escape the diggers in the field. The traces of these tinier inhabitants of the Thomas Farm area of eighteen million years ago, are only recoverable through careful screen-washing and sorting under a dissecting microscope.

This activity has changed the way my students think about several things. First, finding tiny bones of tiny animals allows the students to see beyond the huge beasts that they often see in museums and read about in books. There were other animals besides horses, rhinos, camels and bear dogs in ancient Florida. In that way, it was much like today. Every niche was filled. Second, paleontology becomes something that they can do, not just something that other people in other places can do. This is the first time that some of my students even consider science as an activity, not just facts in a book. This is a giant step for them. Third, in a small way this activity allowed the students to make a scientific discovery. Even if the bone was tiny and the discovery very small, it was a discovery. It allowed them to be one of those people who add to the body of science. It left the students with a great sense of accomplishment.



In a few months, I will be going back to Thomas Farm for my fourth year's digging. I have yet to find a jaw. Maybe this year will be my year. But you can bet I will find a way to bring back the material for the best lab of the year so that my students can go on discovering!  
(Beverly Rawlings)

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## Atavisms or "What Goes Around Comes Around"

Atavism is "the appearance of a characteristic presumed to have been present in some remote ancestor; due to chance recombination of genes or environmental conditions favorable to their expression in the embryo" (Taber's Cyclopedic Medical Dictionary, 2001). Atavisms also are called "throwbacks" and can be found in modern horses (*Equus caballus*) and their relatives despite millions of years of evolutionary separation from their fossil horse ancestors. While an atavistic trait such as polydactyly (extra toes) rarely occurs in horses, other atavistic traits such as roman nose, limb contractures and dental defects occur more often.

Atavisms in horses are of interest to James R. Rooney, DVM, my colleague and Professor Emeritus from the Department of Veterinary Science, University of Kentucky. Besides being an equine pathologist Dr. Rooney studied paleopathology of fossil horses at the Florida Museum of Natural History (see a review of his visit in Pony Express Volume 4, Number 1 of 1st Half 1995). Much of this review on atavisms in horses is based upon Dr. Rooney's publications and personal communications. We must give credit where credit is due.

Probably the most well-known atavism is polydactyly of modern horses (photo to right). This condition is similar to the extra toes found in many of the three-toed fossil horses including *Archaeohippus*, *Parahippus*, *Merychippus* and *Neohipparion*. According to historical records, the prized horses of Alexander the Great (*Bucephalos*) and Julius Caesar had extra toes. Although Stephen J. Gould discussed polydactyly of horses in his book "Hen's Teeth and Horses Toes" and there are numerous accounts in the scientific literature, in my 40 years of owning horses (I am telling my age now!!) I have only seen this phenomenon once in a yearling Quarter Horse. Various forms of polydactyly are seen in humans usually in association with certain genetic disorders and in the famous six-toed Hemingway cats from Key West, Florida.

Forelimb contractures (permanent shortening) of newborn foals due to hypoplasia (arrested development) of the distal end of the metacarpal 3 (Mc3) are seen in all horse breeds. Foals with this condition usually have other skeletal abnormalities and do not survive. The hypoplasia of Mc3 in these foals is very similar to the normal Mc3 condition in *Mesohippus* and may be considered to be another atavism (see figure 11.15 in Bruce MacFadden's book "Fossil Horses" for a comparison).



*Fetlock joint of a young race horse showing extra toes. The condition was exhibited on both front feet. (x-ray taken at the school of Veterinary Science, University of Florida, with permission of Irish Acres*



*A good example of a "Roman Nose" is usually only found in today's heavier horses of Eurasia. Teri Lear Illustration*

some horse breeds, a roman nose (convex nasal bridge) is common and even desirable. One such breed is the Kladruby horse of the Czech Republic (page 4). Kladruby horses have a common heritage with the famous Viennese Lipizzan horses. The head of the Kladruby horse looks remarkably like the head of the Pleistocene horse *Hippidion* from South America. Thus, this could be an atavistic trait perpetuated in this breed. In other horse breeds, roman nose is an undesirable trait and selection is for horses with smaller, elegant heads. Today the Roman Nose usually appears only in the heavier-boned breeds of horse found in Eurasia, but it may appear occasionally in some of the lighter horse breeds.

Atavism may be responsible for tooth defects in modern horses. According to the paleontological record early equids were browsers with no cement in their teeth. About 40% of modern horses exhibit cement hypoplasia of the first maxillary molar (4th upper cheek tooth). These horses are

prone to tooth infection because food debris packs in the hypoplastic areas setting up bacterial infections that will ultimately destroy the tooth unless treated. These smaller, less folded teeth are similar to the low-crowned brachydont teeth of the browsing fossil horses.

So why do we see atavisms? Because the DNA of modern horses is basically the same as the DNA of fossil horses although millions of years have passed. Fossil horse genes are still present in modern horses, but their expression is "silenced" by mutations in the DNA so most horses are "normal". New mutations in the genes or environmental conditions in utero can restore gene function by turning these genes "on". This results in the expression of an atavistic trait. Thus, the old adage, "what goes around, comes around" even applies to DNA. (Teri L. Lear, Ph.D.)

Further reading: 1. Stephen J. Gould (1983). *Hen's Teeth and Horses Toes*. W.W. Norton & Co, Inc., New York. 2. Bonnie J. Hendricks (1995). *International Encyclopedia of Horse Breeds*. University of Oklahoma Press, Norman. 3. Bruce J. MacFadden (1992). *Fossil Horses*. Cambridge University Press, New York. 4. James R. Rooney (1997). Equid paleopathology. *Journal of Equine Veterinary Science* 17(8):430-446. 5. James R. Rooney & John L. Roberston (1996). *Equine Pathology*. Iowa State University Press, Ames.

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## **Badlands Fossils Delight Kids at the Lexington Children's Museum**

*Editor's note: Judy Lundquist is the Exhibit Designer at the Lexington Children's Museum. While she communicates, interprets and promotes science for a living, science is also her avocation, especially earth, space, and life sciences, but her passion is paleontology. In June 2001, Judy participated in the Pony Express Badlands Fossil Hunt.*

Many people think of the Great Plains as just a lot of featureless flatness, a kind of grassy welcome mat set out before the more attractive Rocky Mountains. But stop awhile, say, at Reed and Barbara

Toomey's place on the High Plains of northwestern Nebraska. Look up to the admirably well-named Pine Ridge, with rocks abundant as well as trees. Look across acres of wind-shuffled grass, and find gently colored layers of soft badlands formations. And look in the badlands (not well-named) to find treasure.

Under slow, constant erosion by wind and water, these badlands gradually give up fossils of Oligocene mammals and other animals - treasure indeed. And not just a few. Turtles are especially plentiful. Oreodonts appear to be pushing their snouts out through the soil to catch a breath of fresh air, after 35 million years underground. Monsters like titanotheres rest here, waiting to be freed from the earth.

Sometimes that freedom is gained by some hard human labor. Here come the paleontologists, with their picks, shovels, brushes and other instruments. Some of the most curious people on Earth, the paleontologists, and those of us who help them, work to unlock the secrets of the past. In June of 2001 our group, led by paleontologist, Dr. Bruce MacFadden, from the Florida Museum of Natural History, unearthed a nearly complete titanotheres, carefully uncovering the bones, protecting them with plaster jackets.

The titanotheres is destined to have a second life as part of the collections of the Florida Museum of Natural History. It will teach us, inspire us, and awe us with its strangeness. Some of the oreodonts get to have a second life, too. They have come to the Lexington Children's Museum to help children learn how to find out about the distant past.



*Spectators watch with rapt attention as a preparator slowly frees an oreodont skull from its plaster jacket. George Weems photo*

The oreodonts recently appeared, along with dinosaurs, fossil horses, and local invertebrate fossils, at a day-long event at the Lexington Children's Museum. Mary Fitzpatrick and Chris Parette, volunteer preparators at the Cincinnati Museum of Natural History, removed rock from a large jacket to begin revealing a skull and other bones. Using a previously prepared oreodont skull and illustrations, they showed hundreds of kids and their families what the animal looked like, and identified bones as they were revealed. Visitors were particularly interested in the techniques of flaking the rock away, gluing the bones, and had many

questions. A favorite was "How do you know where the bones are?"

In Nebraska, I learned that harvester ants collect fossils. They pick up hard materials of a certain size to mound up around the entrances to their underground nests. In such fossil-rich territory, bone bits and teeth of tiny vertebrates are abundant enough to be concentrated into the mounds. You have to collect this material carefully, because you don't want to take too much. The loss of a mound can kill the ants. Some paleontologists feed the ants and carefully "harvest" the mound material yearly. I collected about half a small Ziploc bag.



I had no idea what riches awaited me. I dumped out the first bit of material, and there was a tooth! There were many, many bone fragments. I separated the material into several film cans. Each child who wanted to search the material got a film can and a white paper plate. They dumped the material on the plate and picked through it. They learned incredibly fast how to pick out bone and teeth. Some children could not get enough! They went through several cans. (I kept the teeth for identification, but recycled the bone back into the cans, for more kids.) This is a wonderful activity, because it is dealing with the real thing. Adults also enjoyed it. Everyone appreciated the fact that the fossils were real.



*Geologist Chris Rudnick from Nebraska volunteers his time to identify tiny fossils found on anthills in Nebraska, at the Dinos-all-Day event at the Lexington Children's Museum. George Weems photo*

Many people are familiar with the idea of digging for fossils. Movies and television documentaries often emphasize adventures in the field. I hope my museum's programs will lead to an appreciation of the important work that happens after the dig, and thus gain a more complete picture of the science of getting at the distant past. After training in the Cincinnati Museum's lab, I will be doing further preparation on the oreodont jackets with museum visitors. I have made casts of parts of an oreodont tibia. Children will reassemble the complete "bone" with modeling clay "glue", getting a hands-on feel for another aspect of paleontology. A couple of museum volunteers were fascinated with the anthill paleontology, and they will be helping me present this activity to more children and their families.

Lexington Children's Museum is deeply grateful to Reed and Barbara Toomey for hosting our group, for donating the Nebraska fossils, and for hand delivering a very large and heavy jacket right to our door in Lexington, Kentucky. Thanks to our mentors, Bruce MacFadden, Sue and Steve Hutchins, and Jim Toomey. Thanks also to Bruce MacFadden and the Florida Museum of Natural History for their support in enabling me to experience this fascinating part of the Great Plains. I never even got to the Rockies.  
(Judy Lundquist)

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## **A Pleasant Surprise on a Beautiful Evening**

During the Badlands Fossil Adventure in June 2001, Bruce MacFadden and the trip participants had dinner one night out near the fossil localities at the High Plains Drifter "Cook Shack." Unbeknownst to





*Bruce MacFadden and Marion Galusha at the "Cookshack".*

Bruce, the Toomey's had invited a friend, Marian Galusha to dinner. Neither Marian nor Bruce knew that the other would be in attendance, so both were in for a wonderful surprize. Marian Galusha, from a homestead family in Chadron, Nebraska, is the widow of Ted Galusha, a long-time fossil collector for the Frick Laboratories in New York. Bruce and Marian first met when Bruce was a graduate student at Columbia University in the early 1970s. In the summer of 1972, Ted showed Bruce and a contingent of Columbia students and professors around the important fossil localities north of Santa Fe, New Mexico, where Ted, Marian, and their children lived for many field seasons. Based on this trip, Bruce decided to do his doctoral dissertation studying the age of the Santa Fe fossil deposits using paleomagnetic dating techniques, which were in their infancy in the early 1970s. Subsequently Bruce visited the Galushas in Nebraska and had guided tours of important fossil localities in the Nebraska badlands and experienced the wonderful hospitality of the Galushas at their family homestead.

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## A T. rex named "SUE" opens to Large Crowds at the FLMNH



In late January the travelling exhibit "A T. rex named Sue" opened at the FLMNH. Produced by the Field Museum of Natural History in Chicago, this exact replica of the world's most complete T. rex. has attracted much attention within Gainesville, the surrounding community, and northern Florida. The Members Preview of Sue on 24 January attracted 902 visitors that evening, far eclipsing the previous record attendance for the members preview showing. During the first month, "Sue": has attracted some 20,000 vistiors to the FLMNH, more than doubling our attendance during a similar period of time. In conjunction with "Sue", Dr. Chris Brochu of the University of Iowa (formely of the Field Museum) came to town and presented a popular Sunday lecture to some 175 people entitled: "The science of Sue." "Sue" has been the talk of the town in recent months, and has done wonders to promote paleontology and the museum. This exhibit, which is the only public

venue for "Sue" in the southeastern U. S., runs through Sunday, May 19th. Admission is \$4 for adults and \$2 for children.





*"Sue" hungrily studies the crowd gathered around her at the Florida Museum of Natural History. Tammy Johnson photo*

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## Spring Fossil Dig

**The Division  
of Vertebrate  
Paleontology  
is cranking up  
for another  
great field  
season -  
Volunteers  
needed!**

**When:** From April 1 through May 10, we will work Mondays, Tuesdays, Thursdays, and Fridays.

**Where:** Field work will begin at the site at 9 AM and continue to about 5 PM. One-hour training sessions will be held daily at 9:30 AM and 1 PM; volunteers should plan their schedule to attend one of these sessions on their first day. Otherwise, volunteers can arrive and leave the site as best fits their schedule, with the provision that they work a minimum of three hours per day at the fossil site. You can volunteer for a single day, a block of days, or a regular weekly schedule.

We will attempt to reschedule volunteers in case of rained-out days, but cannot guarantee that will be possible.

The fossil site is located on private property a short distance off U.S. Highway 27/41 between Newberry and High Springs in western Alachua County. It is approximately a 30 to 45 minute drive from Gainesville, depending on traffic. Detailed directions to the fossil site will be provided to all volunteers after we receive their application form. Volunteers will be able to drive their own vehicles to the fossil site.

**Requirements:** Minimum age for regular volunteers is 15. Volunteers need to be of at least moderate physical fitness and be able to work outdoors for extended periods. For insurance purposes, volunteers must sign a liability waiver. All fossil specimens collected during the excavations become the property of the Florida Museum of Natural History.

**How to apply:** Fill out an application form ( forms are available from our web site at : /vertpaleo/2002\_dig.htm)and mail it to the indicated address. If you are on the UF campus, you can pick up and deliver application forms at Dickinson Hall at the corner of Museum Road and Newell Drive.

**Need more information? Send inquires to:**

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

## ***Pony Express***

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### **Editorial Staff:**

- Bruce J. MacFadden Program Director
- Erika H. Simons, Editor and Program Coordinator

### **Direct all Correspondence to:**

#### ***Pony Express***

Exhibits & Public Programs  
Florida Museum of Natural History  
Powell Hall -- P.O. Box 112710  
Gainesville, FL 32611-2710  
Phone: (352) 846-2000 extention 255

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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.

### ***Donations to the Fossil Horse Fund -- 2001-2002***

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