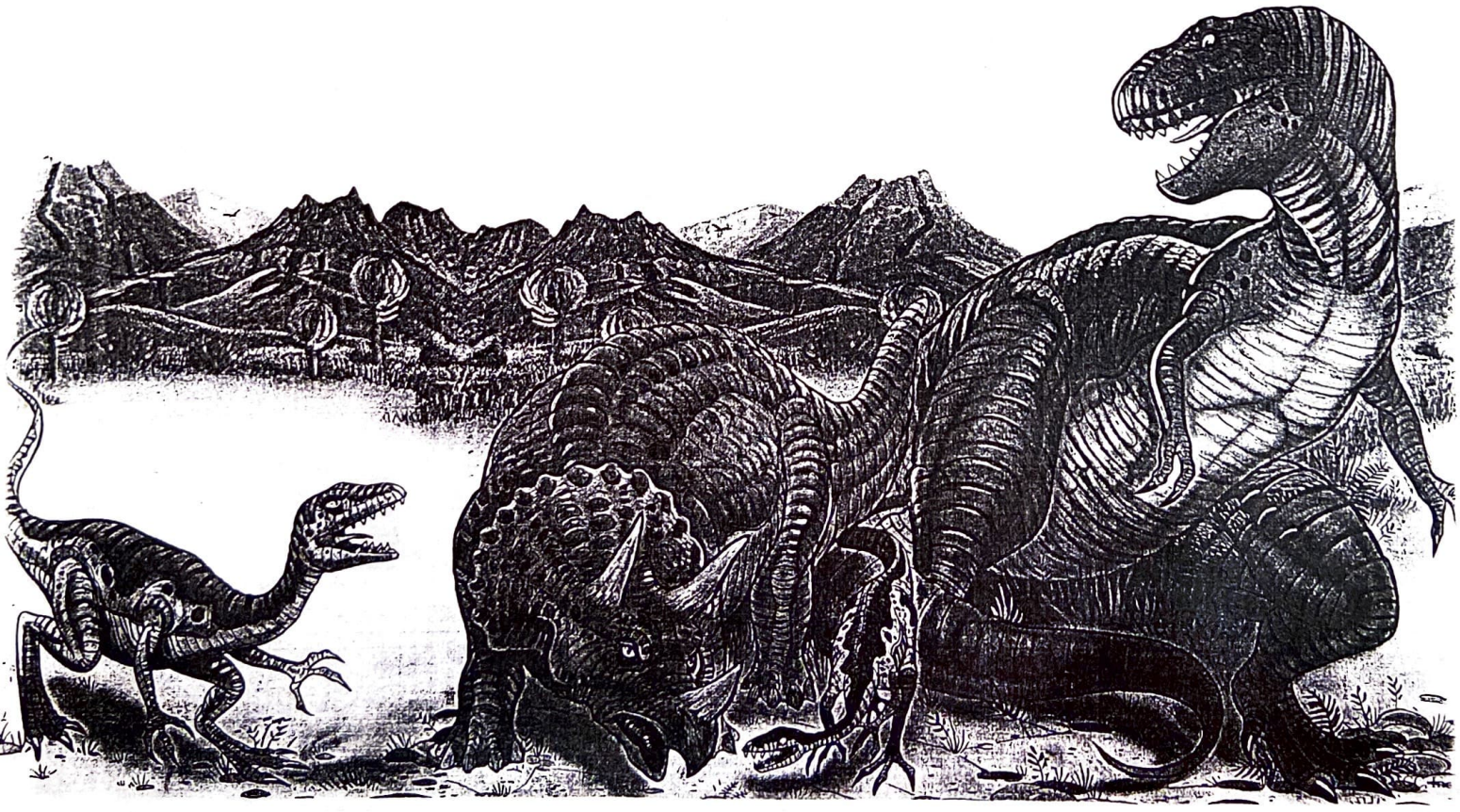
The Hartman Prehistoric Garden at Zilker Botanical Garden

Walking Tour



Walking Tour of the Hartman Prehistoric Garden

History ....

The Hartman Prehistoric Garden is built on the site where over 100 tracks made by six or seven reptiles were found in 1992. Following the discovery, paleontologists studied the tracks and investigated how best to preserve them. As the tracks were made in friable limestone they started to deteriorate rapidly. It was then decided to map them and make casts of them before reburying the tracks to prevent further loss from exposure. The garden created above these fossilized impressions is composed of the kinds of plants that were around at the time of the dinosaurs. These were the spore producing plants (ferns, mosses, horsetails and liverworts), the Gymnosperms (cycads, conifers and ginkgos) and the first Angiosperms (magnolia, laurels, palms, etc.). The gar in the moat around Dino Island (an ancient type of fish), the dragonflies we hope to cultivate in the upper pond and the butterflies that fly over from the butterfly garden are all part of the Cretaceous scene.

Meet our dinosaur!

The full scale sculpture on Dino Island is the dinosaur believed to have made tracks in Zilker Garden nearly 100 million years ago. This dinosaur is classified as an Ornithomimus (Greek for "bird like"). It is shown full sized at 8 feet tall and 13 feet long, and it had a larger brain (for its size) than most dinosaurs. Because it did not possess teeth (but had a beak composed of keratin) Ornithomimus is presumed to have eaten frogs, salamanders, various eggs and plant matter. Its peculiar forepaws probably did not function well for defense but, fortunately scientist believe that Ornithomimus was fast on its feet and could escape its predators at up to a swift 40 miles per hour. In gait and stride it would have looked very much like an ostrich or emu in motion, utilizing its long tail for counterbalance.

CRETACEOUS FLORA

The Cretaceous was a very exciting time in plant history. Along with the evolution of the Angiosperms plants came a great diversification of insects. Dragonflies, butterflies and other insects co-evolved with plants providing the advantages of more effective pollination.

Earlier land plants reproduced with spores rather than seeds. Fern spores are released from structures under the fronds called sori. They germinate to produce a tiny haploid plant (the prothallus) where sex takes place to produce the more familiar macrophyte (a large leafy diploid plant). The native liverworts below the waterfall are a primitive type of non vascular plant (meaning that they don't have an internal conductive system) that might have descended from algae following a distinctive line.

The Gymnosperms were the first seed plants. They produced cone-like flowers that funneled pollen to the ovaries (the female structures) resulting in exposed seeds. The word gymnosperm means "naked seed", which you can appreciate when you shake a pine cone and watch the seeds fall out.

Angiosperms (="seed vessel") were a later innovation in land plants and the group that really took off during the Cretaceous. In angiosperms the ovules were borne inside a structure that developed from modified leaf folded onto itself. Because the ovules were not exposed pollen grains had to land on the receptive female part (the stigma) and grow tubes down through the style to ovules that held the eggs. The tissues surrounding the eggs developed into structures to protect and disperse the seeds. We call these structures fruits whether they are succulent and edible or dry and papery.

The Hartman Prehistoric Garden features an unusual collection of cycads, primitive gymnosperms that are thought to have evolved from ferns when the climate turned hotter and drier. Cycads date back 250 million years and have been found worldwide, evidence of their widespread distribution before the breakup of Pangaea (the supercontinent) around 130 million years ago.

As you first enter, on the right, you see:

A group of **Sago palms** (*Cycas revoluta*). This particular plant is not a true palm, but a cycad native to the southern islands of Japan (the Ryukyu Islands) from the Mesozoic era (225-160 million years ago). Cycads are dioecious (literally "two houses") a fancy term for the fact that there are separate male and female plants. If you look at the right time of year you can see either the long, thin cones of the male or the cabbage like cones of the female. At the base of these plants is a specialized root, called a coralloid root, which forms a symbiotic relationship with a blue-green algae. This enables them to fix nitrogen directly out of the air instead of taking it from the soil, allowing them to subsist in extreme habitats where there is virtually no soils. In their native habitats they grow on cliffs along the ocean, rooting right down into solid rock. In harsh situations cycads will grow slowly but will endure where other plants wouldn't survive. Dinosaurs ate the foliage and conelike fruits of cycads, but they are toxic to other animals (a note to Central Texans: deer will not eat cycads!)

Continuing up the path, against the cliff to the right:

Further into the garden we see more gymnosperms, there is one large and several small **Japanese Yew pine** (*Podocarpus macrophyllus*), ancient gymnosperms from the islands of Japan.
Just across the path towards the dinosaur we see a row of **ginkgos** (Ginkgo biloba, or maidenhair tree, from the Ginkgoaceae), considered one of the ancient relatives of the gymnosperms. The ancestors of these unusual trees are native

to China where fossil remains have been discovered and dated from the late Paleozoic onward. They are almost extinct in the wild, having survived due to cultivation by Chinese monks. As the females produce odoriferous fruits, the male plant is predominantly planted. Ginkgo fruits are eaten in the Orient and an extract of the dried leaves has gained such a reputation for sharpening mental acuity that it is now being sold as an herbal supplement.

Directly across from the podocarpus and next to the ginkgos we have a rare specimen of the **Dawn Redwood** tree with the intoxicating Latin name Metasequia glyptostroboides and a rather famous history. Until the 1940's, this tree was known only from fossil remains from the Pleiocene (5 million years ago). These fossilized portions were given a Latin name that referred to their similarity to Sequoias) and their confusion with the Chinese swamp cypress (Glyptostrobus lineatus). At about the same time (1941) a Chinese forester discovered a strange deciduous (leaf dropping) conifer in an eastern Szechwan province. Too make a long story short, in 1948, an expedition was sent from Arnold Arboretum to collect seeds which were distributed worldwide and it was determined that this was a relic population of this long lost species. Ralph Chaney, a professor of paleobotany from UC at Berkeley suggested the name Dawn Redwood to emphasize this trees early fossil record.

Right beyond the dawn redwood we have a group of **Saw Palmettos**, Serenoa repens. This is a native and very ancient plant that is the source of the herbal supplement. Fruits of the saw palmetto are sold as a remedy for BPH, which is benign enlargement of the prostate gland, a common affliction in men over 50. Researchers believe that the saw palmetto extract works by inhibiting the conversion of testosterone to DHT, and by inhibiting the binding of DHT to its receptors. DHT promotes enlargement of the prostate. Recently saw palmetto has also been touted as a remedy for androgenic alopecia (one cause of hair loss). Saw palmetto is also the active ingredient in a breast enlargement supplement (MegaBust) and as a treatment for impotence (Red Rooster).

Walking further up to the right we have some of the first palms we see in the garden the palms, flowering plants that botanists consider monocots:

Arenga tremula, a genus of small palms from Southeast Asia. It's very unusual.

Then we have a little group of cycads, *Macrozamia johnsonii.* Right next to these,

in front of the little water catchment on the cliff:

is the **Japanese Plum yew**, (*Cephalotaxus harringtonia)*, another really ancient, weird type of gymnosperm from Japan. Right in front of the

catchment is a small but interesting *Macrozamia riedlei*. Both species of *Macrozamia* are cycads from Australia.

Planted in the foreground and in many areas around the entire garden, is a groundcover that looks like a four-leaf clover, but it's not. It's a fern, *Marsilea sp*. It's a North American fern that evolved in buffalo wallows. It can withstand both flooding and drought. In dry periods it will die down, returning in the rainy periods to form a dense ground cover. Ferns dominated the landscape in the Carboniferous period (280-342 m.y.a.) and survive to this day....Once our palms and overstory plants grow sufficiently to provide shade in the garden, we hope to include more shade loving ferns.

At the bottom of the cliff, up a little ways more:

is an **Alligator juniper** (*Juniperus deppeana*), from the southwestern mountains of the United States.

On top of the cliff are:

various little juniper-like things. Some are blue, some are green, some are red - in the winter they can turn all sorts of different colors. These are all different cultivars of a very widespread plant, the **Chinese juniper** (*Juniperus chinensis)*. It's found in China, Mongolia, Russia and Japan.

Also on top of the cliff, just under the Mountain laurels, is a little Chinese Needlepalm (*Guihaia argyrata*), from southeastern China that grows on limestone cliffs.

With the shelter is on our right, we are walking up that path and still looking to the right.

The *Marsilea* fern has petered out and we see little winter-burnt things. They will put out new leaves in the spring. It is a very small, interesting cycad, *Zamia vazquezii*. It looks like a fern, but it is actually a cycad.

On top of the low cliff here is *Chamaedorea radicalis*, which is a palm from Mexico.

Further up and to the right:

is a grouping of three *Zamia integrifolia*. This is the cycad from the southeastern United States, mostly Florida and up into Georgia.

As you walk around the back of the shelter:

is an **Italian stone pine** (*Pinus pinea*). There are a couple of small **Sago palms**, and ferns.

There is **Aspidistra** (*Aspidistra elatior*) planted behind the shelter. It's a widely used landscape plant with the common name "cast iron" due to its reputation for hardiness. Its slow growing and also very primitive.

Around the shelter we have left the **Cedar** (*Juniperus ashii*), which is also a very primitive plant. This, of course is our native juniper, the notorious tree whose males release copious quantities of pollen in the winter time, attacking our mucous membranes and causing the symptoms of "cedar fever".

Walk around the top of the overlook, looking out towards the dinosaur. At the end of the fence railing, to the right:

we come to another **Sago palm**. This one is a female, and about 30 years ago, it apparently had frost damage to the meristem. This has left us with a multi-headed Sago palm. Right next to it on the left:

is a plant that may not be a true dinosaur plant, but it has a primitive feature. **Texas redbud** (*Cercis texensis)* blooms along the stems (a condition we call "cauliflory"). This is an unusual specimen donated by Madrone Nursery. It is a trailing redbud, a cultivar that Dan Hosage found and has vegetatively propagated and patented. It will not grow up like a tree, but will grow down, trailing over the cliff.

Dead end, right in front of us:

we have a rare palm called *Trachycarpus takil* from the Himalayan mountains. It grows well here but is just very uncommon. In the past, seeds have been very hard to come by.

There's another *Cephalotaxus harringtonia;* there's another **Sago palm**.

Walking around, still with the border to the right, we come to:

a very long, trussed species. It's **Arizona cypress** (*Cupressus arizonica*) from the southwestern mountains of the United States. Planted behind that is a Mexican fan palm *(Sabal mexicana* or *Sabal texana)*. Then there's an area where we have a lot of *Marsilea* and some little *Trachycarpus* palms. Then we come to this large, female **Sago**. Behind that are some very large **Chinese windmill palm** (*Trachycarpus fortunei*). It's a good one for this area - very cold hardy. Planted a little behind that is another cultivar of the **Chinese juniper** - this is an upright form.

Further along, behind the tallest of these *Trachycarpus* palms is an **Afghan pine or Mondo pine** (*Pinus brutia ssp eldarica*), also sometimes referred to as *Pinus eldarica*, but that's not the proper name. This is from

Azerbaijan, Afghanistan and Pakistan.

At the trash can:

is a **Stone pine** (*Pinus pinea*). Then we have **Montezuma cypress** (*Taxodium mucronatum*). It is related to the Bald cypress, but is from southern Texas and Mexico and is therefore much more drought tolerant (this is the preferred cypress to plant in Central Texas). These can grow quite tall, in fact, the largest tree in all of North America is not a Redwood or Sequoia - it is probably a Montezuma cypress down in Oaxaca, with a circumference of 190 feet.

Now we have walked up to the Y, facing south. What we have in front of us is a little hillside.

To the left we have a **Leland cypress**, sometimes referred to as *Cupressocyparis leylandii*, which is a misnomer. It is a hybrid of *Cupressus nootkatensis* and *Cupressus macrocarpa*. This plant occurred in Great Britain originally and is now a common landscape plant.

Also in front of us on the hillside is a cycad that looks like a Sago palm, but it's not. This is the **Prince sago** (*Cycas taitungensis*), from the island of Taiwan. There are all different sizes planted here on the hillside. There are large and small **Chinese junipers** planted there and a number of **Arizona cypress**.

Continuing towards the Butterfly Garden, on the right:

in this little depressed area, we see a planting of **Palmetto palm** (*Sabal minor*), which is a native Texas palm. It never gets much of a trunk and likes damp places.

To our left is a bunch of cycads with long, thin, strap-like leaflets. This is *Ceratozamia kuesteriana*, a cycad from Mexico.

Continuing on our right, we have *Aspidistra*, *Sabal texana* at the back border, and a couple of little *Sabal minors* planted throughout here, and **Montezuma cypress**.

Leading up to the big Oak tree we have some **River fern** planted in there. Past the Oak tree is more **Aspidistra**. Then we come to a *Sabal minor* planted around a Cherry laurel, which is a native plant that happened to be growing there. Back around that are three cycads, *Ceratozamia mexicana*.

Continuing towards the end of the Dinosaur Garden, on your right:

we have a planting of ferns in this little low area. In the middle of that we have a **Needle palm** (*Rhapidophyllum hystrix*). This is a native palm from the southeastern United States - Florida, Georgia, Mississippi and Alabama. This is probably the most cold-hardy of all palms in the world. It is very slow-growing and has fierce needles at the base.

Turning back around, going back into the Dinosaur Garden, looking to our right:

are **Montezuma Cypress** and more **Aspidistra**. In back of the rock and Aspidistra, is the **Bamboo cycas** (*Ceratozamia hildae*) from Mexico. It looks similar to bamboo and is a very interesting plant, well suited to our area. Continuing along is more *Sabal minor*, and another **Montezuma Cypress**.

Turning the corner here:

what we have in back of the **Montezuma Cyperus** is a planting of **Bamboo palm** (*Chamaedorea microspadix*). This is a very interesting understory palm from Mexico, quite cold-hardy. In the spring you will see it flowering along the stem. We pass another **Afghan pine** on the right,

continuing up this to this little pond. Around this pond we have:

a planting of *Marsilea*. We have *Sabal mexicana*, the tall palms. The smaller palms are **Chinese fountain palm** (*Livistona chinensis*).

Looking to our left, just under the cedar, with very stiff, thin leaves, we have three *Dioon angustifolia*, a newly described species of cycads from the mountains of northeastern Mexico.

Continue down the path, between the upper pond and the little river that flows down, where you start to turn to the left.

To the right we have a nice specimen of **Needle palm** (*Rhapidophyllum hystrix*), and **Montezuma Cypress**. The planting along the cliff is of **ferns** and **aspidistra**. After the Montezuma Cypress is a **Texas Redbay**, (*Persea borbonia*). This is a very interesting, primitive tree from the Avocado family.

Looking to the left is the **Kentucky coffee tree** (*Gymnocladus dioica*) from the southeastern USA. It is a very primitive legume (a member of the bean family characterized by a fruit that develops from a single carpeled (chambered) ovary that splits along two sides when mature (eg: bean pods!). Seeds from this tree have been ground and used as a coffee substitute in times of shortage.

Under and behind the coffee tree are two different kinds of cycads. One

has long, narrow leaves, which is a subspecies of *Zamia integrifolia* called Palotka Giant. It's from northern Georgia and gets quite big. Another common name for this is the Coontie, an Indian name.

Going east:

on the right is a **Yellowwood** (*Cladrastus lutea*), another very ancient legume from Kentucky and Tennessee.

Continuing on, to the right we see among the **aspidistra** and **ferns**, the **Anacacho orchid tree** (*Bauhinia lunaroides*), which is also a legume from a very ancient family. We can tell that by its distribution around the globe. Bauhinias are underutilized ornamentals in our landscapes. The common name refers to the delicate flowers which are orchid like in appearance.

To the left we have a lot of **Montezuma Cypress** back in here with Palotka Giants. Across the creek on the other bank is a planting of *Sabal minor*.

Continuing on, there is a little bridge to the right that crosses over the stream. To our left are:

some palms. The really tall palm is another example of *Trachycarpus fortunei*. The palm with the recurved leaves and not too tall is *Butia capitata*, or **Pindo palm or Jelly palm**, from South America. Just to the right of the Pindo palm, is a plant with very stiff leaves. It's actually a cycad from Australia, *Macrozamia moorei*.

Looking back to the right we have this little bush that is called **Banana magnolia** (*Michelia figo*), an Asian member of the Magnolia family. The pretty yellow flowers smell like bananas.

On our left, with the palms in the background, is **Sweet bay magnolia** (*Magnolia virginiana*).

Magnolia blossoms demonstrate some of the characteristics that scientists consider "primitive" in the evolution of flowers. They show numerous, spirally arranged ovules, and the seeds are enclosed in arils suspended from the cone-like fruits by slender threads

Behind the magnolias are is more *Macrozamia moorei*, and those three **Blue palms** (*Brahea armata*), a fantastic desert palm from the northern Baja California.

We've also recently added several River Birch along this side, and will add more info on them later.

Coming up to the waterfall, there is a little Y in front of us. Taking the left hand turn, we are looking across the pond towards the dinosaur. What we see across the pond are:

Ginkgos (*Ginkgo biloba*), a relict gymnosperm from China (see the earlier description). In front of those are three **Chinese Star magnolias** (*Magnolia stellata*) -

On the island with the dinosaur are three *Dioon edule*, the cycad from Mexico. Closer, in front of us, is 'Long Tall Sally", another **Ginkgo** on this side of the palm (the nickname was given to this tree because it was found potbound in the back of a nursery so we'll be watching to see how it develops now that it has room to spread its roots). To the right of that, in the background are two small palms from Australia, *Livistona deappeanna*, or the **Weeping Ribbon palm**. In front of those are two spiky looking palms. The left one is *Phoenix dactylifera*, and to the right is *Phoenix sylvestris*. Those are **Date palms**, the source of the edible fruits..

Continuing now towards the shelter, we see right in front of the shelter:

is a big palm, *Arenga englerii,* a clumping, low-growing, spreading palm from the island of Taiwan.

Turning around, walking back towards the waterfall, taking a left at the waterfall:

To our right is a **Banana magnolia**, a *Persea borbonia*, more **Banana magnolia**, and a large **Needle palm**.

To the left, crossing over where the stream goes across the path:

There is **Banana magnolia**. There is **Wax-myrtle**, a native plant to southeastern Texas and Louisiana. It's found as an understory in Pine forests and a very ancient plant. To the right and left, scattered throughout here, is *Loropetalum chinense*. We have the normal variety and the one with red leaves, which is a cultivar. It's a very beautiful, ancient plant, in the Witch hazel Family (Hamamelidaceae).

At the bench to the right:

We have a species or cultivar of **Aspidistra**. It's very low-growing with little yellow dots on the leaves. I think its something from the horticultural industry. I don't think it occurs in the wild.

Walking further, to our left:

we have another **Stone pine** out towards the island, and we have a variety of *Magnolia grandiflora* var. *'Little Gem'*.

At the bottom of the fence at the Rose Garden:

there is a very interesting primitive grass. This is the native **Switch cane** (*Arundo gigantea*), of the southeastern United States. It used to grow abundantly along all of our river systems, known as cane breaks. It's a native bamboo that is rarely planted.

Walking around the path, to the left, next to the rock:

is a tall, thin tree. That is the **Pond cypress or Bald cypress**. But this is a special variety, *Taxodium distichum ascendens*. It's like the Lombardy poplar of the Bald Cypress world.

Walking around again, to our left:

is the tallest **Montezuma cypress**, donated by Peerless Farms. Underneath that are some very interesting cycads, *Bowenia serrulata*, sometimes called the **Bifield fern**. But it's not a fern at all - it's a cycad from eastern Australia.

To our right we see the little petrified wood forest, and to our left we see this cliff.

Back behind this cliff - they are small now - there is a very interesting cycad planted called *Cycas panzhihuaensis*, from the mountains of central China.

Behind the basalt bolder we have a very rare tree, Franklinia alatamaha, a member of the tea family (Theaceae). A small grove of these unusual trees was discovered by the famous botanist John Bartram on the banks of the Altamaha River in Georgia in 17 and named for his great friend Benjamin Franklin. Bartram collected seeds on a later trip. All of the trees alive today are descended from this population. Franklinia has a reputation for being difficult to grow, but those who are successful are rewarded with huge 5 inch flowers (white with numerous yellow stamens) which appear in the fall about the same time the foliage is turning shades of red.

The basalt boulders on either side of the entrance (exit) were donated by L&R Landscapes, the firm that executed the plan for the garden. The boulders came from a small town west of San Antonio when stones like these are turned into gravel. We don't yet know a lot about this basalt, but visitors might be interested in the geometric patterns made by the white veins in the rocks.

Questions to explore with students in the Hartman Garden Prehistoric Garden....

How old is the earth and how does this garden fit into the scheme of things?

Have everyone stretch their arms out to their sides. Tell them that the distance between their finger tips represents the 4.5 billion years since the earth was formed. Take an emory board and run it across someone's nail explaining that you've just wiped out the amount of time that man has been on the earth....the implications for how we've treated the planet (and effected its environment) are profound.

The Hartman Garden represents the world as it was when our Ornithomimus made its tracks in South Austin. That is, nearly 100 million years ago in the Cretaceous era., one of the most exciting in plant and animal history with the evolution of flowering plants and the great diversification of insects.

Pull out the timeline and show them what the last 540 million years ago were. This covers about the last ninth of the Earth's History (or about the length of our fingers).

The timeline shows the major events since the Cambrian era, including the movement of plants and animals from an aqueous environment which set up the atmosphere for the colonization of land. Plants developed vascular systems, were first spore bearing (liverworts, ferns, mosses and horsetails), then seed bearing (cycads and other primitive gymnosperms) and finally flowering (the Angiosperms).

What are liverworts?
Early, nonvascular (no conducting system), spore bearing plants, mistakenly given this name due to their liver like shape and the belief during the middle ages (the Doctrine of Signatures) that they would be effective treatment for liver ailments.

What are horsetails(Equisetum =horse, hair or tail?) Horsetails (Equisetum spp.) are among the survivors of the Carboniferous Age. The hollow stems have reduced leaves which appear as fringed rings along the stems. Spores are borne in cone-like structures at the ends of the stems. Because the stems of horsetails are full of silica they demonstrate and abrasive quality which lent them to the task of scrubbing dishes, hence the moniker "scouring rush" employed by pioneer women.

What are gymnosperms?

Using a pine cone as a prop you can demonstrate how pine cones get wind pollinated and produces seeds that are blown free when the cone opens up. Ask the students what they think would happen if you were to put the pine cone in water....Place the pine cone in water and check back on it at the end of the tour.

How do we know these things about the past?
What's a fossil and how do we read a fossil?
Fossils are created when the soft parts of an organism decompose but enough of the hard parts are left that the structure is maintained. Petrification occurs as mineral solutions enter the openings and leave deposits.

Ichnofossils are trace fossils, like those left from footprints....
What can these footprints tell us?
They can tell us whether a dino walked upright, whether its were splayed or together and also its speed..how far apart are the tracks, how deep, etc.)

Introduce our Ornithomimus !

How to remember his name: ornitho, as in ornithology, and mimus, = like (mime?), therefore, like a bird?

Can you guess how fast our Ornithomimus ran? (scientists think up to 40 mph) This was probably good as he had few defenses (no teeth and short kind of gangly forelimbs with three fingers)

Why do you think he had a tail? have the students stand in stride and they can experience why a counterbalancing tail might have been advantageous.

What do you think he ate??

With no teeth and short arms his options were limited. Scientists think eggs, salamanders and frogs and various plant parts.

Are birds modern dinosaurs?
scientists are starting to think so and our ornithomimus might be one of the links!

What are ferns?

ferns are vascular, spore bearing plants

Maidenhair fern (Adiantum Capillus-Veneris) is one of many ferns featured in the prehistoric garden. Ferns do not produce seeds but spread by releasing spores from structures called sori which develop on the undersides of the fronds. These spores germinate to produce a diminutive haploid plant, (the prothallus) where sex (the fusion of male and female gametes) can take place leading to the development of the familiar macrophytic (large-leaved) diploid plant.

The ground cover that looks like a clover is actually Marselia, an unusual North American fern that evolved in buffalo wallows. This fern can withstand both flooding and drought. In dry periods it will die down, returning in rainy periods to form a dense groundcover. Ferns dominated the landscape in the Carboniferous period. (280-342 m.y.a.), and survive to this day, once the palms and other overstory plants grow sufficiently to provide shade in the garden we hope to include more shade loving ferns .

What are cycads?

Cycads are though to have evolved from ferns when the climate turned hotter and drier.
There are both male and female cycads (we should always have examples of both in the garden).

The Jurassic was known not only as the Age of Dinosaurs, but also, the age of cycads.

How can we tell that a plant was around before the Cretaceous? Hint: worldwide distribution suggests that a plant existed before the breakup of Pangaea (the supercontinent). You can see cycads from all over the world in our garden.

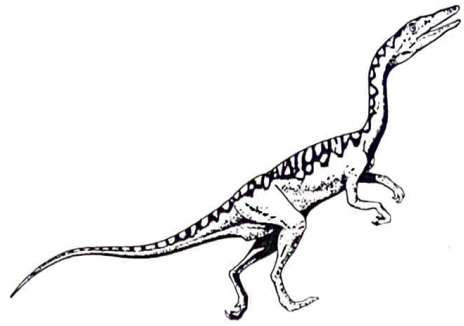
How would the development of seed plants accelerate evolution? (insects became the driving force (just remember that evolution is just a four syllable word for change).

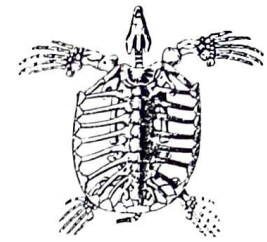
Dragonfly pond...we'll be keeping fish out of the upper pond in order to encourage the development of dragonfly larvae. Dragonflies are among the insects (arthropods= jointed legs) that split their lives between an aqueous and a terrestrial environment....the development of fight opened up a whole range of possibilities for insects. Dragonflies remain little changed from their prehistoric counterparts.

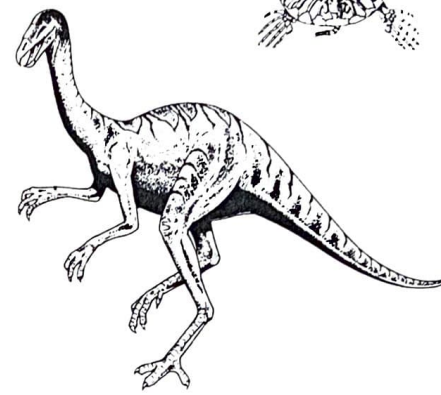
Gar_ an ancient type of fish....one as long as 8 feet has been found in Town Lake. Texas Parks and Wildlife helped with providing these.

other fun things to point out...

the head of a turtle at the top of the waterfall
our own turtle bones...turtles preceded dinosaurs!!!
we're hoping to raise funds to put a bronze turtle statute in the garden.







15. The Dinosaur Garden ...Behind the Rose Garden is the quarry area, so named because in the late 1930's the Civilian Conservation Corps (CCC), removed thin layers of limestone to use in the construction of trails and bridle paths in Zilker Park. In the late 1960's and early 70's, the area was also used. Some of the rock in the Rose Garden came from this area. In 1991, City Workers began to clear the area in preparation for building a butterfly garden. In January of 1992, dinosaur tracks were discovered on the exposed rock surfaces.
Paleontologists have since studied the area and mapped over 100 tracks made by six or seven kinds of reptiles. Most are from a three-toed, bipedal dinosaur, and are dated at 99 million years old. The other tracks may belong to a 4 to 8 foot carnivore (Coelophysis-like), an 8 to 12 foot herbivore (Omithomimus), a sauropod (perhaps Brachiosaurus), and a turtle, whose tracks are on the second horizon. From the position of the tracks, it is thought that the dinosaurs were milling about, possibly eating plants or insects. Turtle bones found on the site have been dated at the same period as the rest of the quarry, and identified as belonging to the genus Osteopygis.

Since discovering and uncovering the tracks serious deterioration due to exposure to the elements and weathering has already occurred. After weighing the options, it was decided that casts should be made of the tracks and bones, and then the tracks should be covered with sand and a geotextile fabric and reburied to prevent further deterioration. We hope to be able to create a garden of the kinds of plants that were around at the time of the dinosaurs (ferns, cycads, horsetail, conifers, palmettos, screwpines, magnolias and gingko). This recreated dinosaur habitat will include a waterfall and pond (complete with waterlilies), a stream and bog area (an attraction to dragonflies, also common in that era), and a replica of an Archeological dig, where visitors can see a few of the original tracks exposed. Replicas of the original tracks will be placed in this Dinosaur Garden.