

Ormand Family Activity

November 2008: Biosphere 2

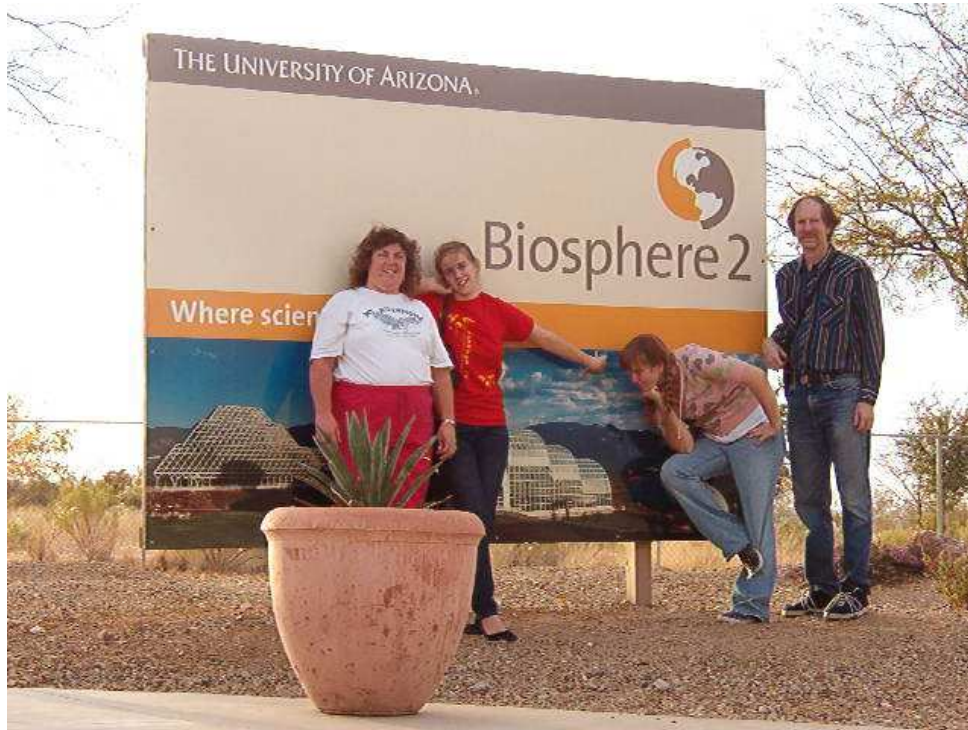
My kids are off of school for the week of Thanksgiving, so I take it off, too. Wednesday, after all the daily obligations (that largely render the value of everyone having off the time useless) are done, we head up the road to see one of those Southern Arizona sights that all Southern Arizonans should see - once.

I wonder if it was a "scientific fad" that was popular, oh, twenty years ago, but there was a lot of interest in the technology for orbital colonies: large Von Braun style wheel-and-hub space stations that would rotate to develop centripetal force "artificial gravity" in the wheel, and permit construction of an earth-like habitat with soil, water, and plants. It seems that, in the late '80s, a "scientist" convinced a rich Texan to build such a habitat on earth as an experiment to see whether a group of humans could operate and survive in a sealed environment. A few years later, Biosphere 2 was finished and ready for the experiment. (Biosphere 1 is the earth itself.)



The fact that this was more than science was apparent from the beginning, with all the breathless hyperbole about the "next phase in human evolution" circulating, but never more obvious than the day than the day the eight "Biosphereans" entered the huge terrarium amid the prayers and chants of New Age shamans and buddhist monks. The "experiment" lasted two years, but actually failed after one year, when oxygen levels dropped to dangerous levels and outside air had to be introduced. The low-carb vegetarian diet proved inadequate for the exertions of the crew to keep the place running. The first-aid style medical facilities were not up to the job when one of them cut the tips of her fingers off in a rice threshing machine, and she had to be removed for real medical care.

Since then, the property has passed through other hands, ending up with the University of Arizona, which is using it for properly planned, *real* scientific experiments in earth science, such as the effect of high carbon-dioxide atmospheres on plant growth, and how temperature affects the health of pinon pine trees afflicted with bark beetles.



For all that, it is an interesting place. Even two girls were interested (briefly, occasionally, when they weren't engaged in pestering each other). But not *that* interesting, and quite remote (an hour's drive from Tucson, through Oro Valley and Catalina, on the north side of the mountains), and somewhat pricey (\$20 per adult; fortunately we had a coupon), so I figure... once was enough. After getting our tickets and looking at the tourist stuff in the gift shop (including some UA promotional stuff), we looked at a ten-minute video which started with a bit of narration from a former Biospherean gushing about "the next stage of human evolution", and then proceeded to some content-free stills and video clips of the inside of the terrarium we were about to see. Then we left the Visitor Center and walked down a lengthy path to the structure itself, and entered the original humans' quarters. We still had a bit of time before the tour, so we looked around. On the entry level was a Biospherean's room, preserved as it was last used, and some chemistry labs and the control room. Upstairs was the tower with the library and common rooms, but it was off-limits to visitors. Downstairs was an exhibit about global climate change (can't say "warming", anymore, since we aren't sure it's still warming) and how humans aggravate it, and what we should do about it. It still strikes me as funny/scary, how these scientists insist that global climate change is caused by "greenhouse gases", primarily carbon dioxide, much of which is produced by human activity, but they also know (and will occasionally admit) that the oceans have vast volumes of carbon dioxide in solution, which is released as ocean temperatures rise. So is carbon dioxide a cause, or an effect? I guess if it is an effect, then it is beyond our power to control, and politically, we just can't talk about that!



Finally, we are ready to start our tour. A little old fellow wearing a little PA set meets us, gives us some background (he's really very knowledgeable), and takes us out into the enclosure. Faith expresses her excitement. Note this view goes way back to the corner. This is roughly the two-thirds point, over the ocean "biome" (habitat setting), looking over the marsh and savannah biomes to the desert at the end.

Looking down into the "ocean" and the beach. There's a stone staircase to the beach in the foreground; another one is visible at the corner of the beach and the wall. A bit of "rainforest" is visible to the upper left. They had a coral reef in here, but it died. Amazing how we are so concerned about the coral reefs (and we should be), but we really can't do anything about them. We really don't know enough. Poor humans - so responsible, so much technological power, so much scientific understanding... and so incapable of doing anything but more harm. It's like we really need Someone Else's help... but we can't allow that!





Faith regards the other end of the ocean, with the wave-making machine. Beyond is the marsh area, and a "wind" making fan.

We proceed along the path and inspect parts of the experiment that is just ending. Up here, it is quite warm, and they have a few pinon pine trees in pots; some are dying, some are not, probably most have bark beetle infestations. We descend to the "savannah", where it is cooler, and there are some more. The UA cleared out some of the original "savannah" for this experiment.

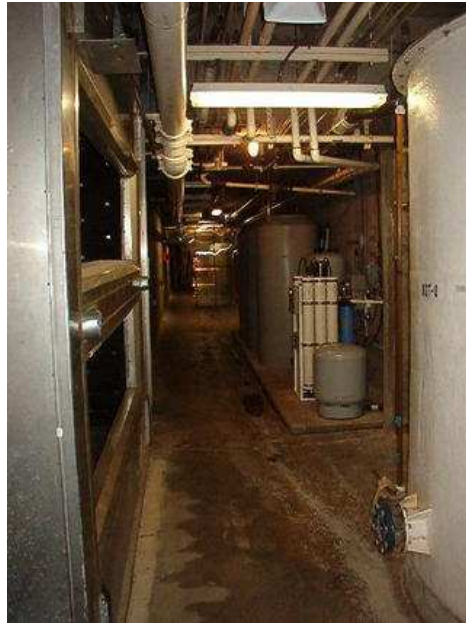
We continue to descend to the desert biome. This area is populated with plants from a North Mexican desert, selected for coming into season during the winter, when plants in other parts of the habitat become dormant. Note the high ceiling. Today was a cloudy day, but on a normal clear day, enough sunlight comes through the glass to make the air oppressively warm. They have to air-condition the place to remove the excess heat load.





We have reached one end of the enclosure, so we go underground.

Here is the "Desert Basement", with lots of pumps and water tanks. This is the lowest point in the installation. There are about three acres under glass, and two acres underground.



The hydrologic cycle is implemented underground. There are "drains" that capture water soaking down through the soil; these are the "aquifers". The air conditioners remove moisture from the air; these are the "clouds". A battery of air coolers are on the left side of this picture. The water is collected in these tanks and pumped to the "waterfall" or the misters in the "rainforest" or the sprinklers in the ceiling for

"rain".

Then we all walk all the way back - under the desert, under the savannah, past racks and boxes and pipes and cables of all the equipment that keeps this little world alive. The sign says "Upper Savannah Basement". The passage slopes upwards, and the seep water runs back down.



We turn a corner, and find ourselves in a gallery. The beach and the "ocean" and the length of the Biosphere enclosure are visible from the windows.

Then we climb some stairs, pass through an airlock, and find ourselves in the "rainforest". Mist is blown out of the air ducts to give the biome its required humidity. The trees, which started off at 8-feet tall when they were planted 15 years ago, are now twenty feet tall. In order to keep the light level low, banana trees (with broad leaves) were planted around the windows - additionally because the Biosphereans (or part of them; it seems they were often arguing and irritated with each other) demanded bananas to supplement their diet.



The intent is to model a Venezuelan forest. At one time, they had some monkeys in here, partly to serve as objects of affection for the Biosphereans. Well, the people liked the monkeys, but the monkeys didn't like the people. So much for being evolutionary cousins! They also had hummingbirds, but the suspicion is that the monkeys ate the hummingbirds.

This was one of the most interesting sights of the trip. Up through the foliage, we could see the "mountain" of sculpted concrete, and the waterfall. I'm not sure what "scientific" purpose a mountain and a waterfall served, but it was neat to see.

We have now seen pretty much all there is to see of the Biosphere 2 habitat. Reluctantly, we follow the guide back down the stairs, back down the passage, and take a turn halfway down. There is a long, echoing tunnel, and an odd little triangular segment, and we emerge into a most interesting chamber. Unfortunately, it is too large and too dark to get a decent picture, but in the center of the "ceiling" is a huge steel bowl, with legs, suspended from a fabric "doughnut". In the floor is a pit holding water. The guide explains: The building is sealed, airtight, "better than the Space Shuttle". During the night, the air inside cools and contracts, and during the day, the air heats and expands. What keeps the expanding and contracting air from blowing out the glass panels? Two rooms like this one, which are called "lungs". As the air expands, the volume in the room expands and raises the roof. As the air contracts, the weight of the steel bowl pushes the air from the room back into the habitat. As a result, the pressure is equalized. He then gave us a demonstration - he opened a door in the wall, and as the air escaped, we could perceive the huge steel bowl settling toward the floor. As we exited through this door, the wind blew strongly past us! Then he opened another door to the outside, and the warm outside air blew strongly past us as we emerged, into the cooler interior.



We are now outside, and the guide points out a cluster of buildings visible past the "lung" dome. The property used to be a working ranch, then an English countess owned it, then Motorola owned it for an executive retreat, then the Biosphere project owned it, then Columbia University owned it. Ultimately, Columbia couldn't see hanging onto something so far away from New York, so a land company obtained it, and was going to develop it for homes, before the bottom fell out of the housing market. Now, UA leases the property from the land company for a symbolic amount like \$100 a year. This was the original ranch house up on the hill. I don't know if it is still used, since the area around the Biosphere is already built up with apartments and sheds and laboratories to support the students and researchers.



We walk around the exterior, and turn this corner to see these great arched enclosures. These were the agricultural areas, where the Biosphereans grew their food crops. It seems they also tried to raise animals, too (in spite of the New Agey vegetarian impression), but the pygmy goats couldn't provide sufficient milk, so they were eaten, and the pygmy pigs ate the same foods as the humans, who didn't need that kind of

competition, so the pigs were also killed and eaten. Wasn't much meat eaten after that.

Now the ag bays are used for other kinds of experiments. They can be partitioned from

each other by plastic sheets. The UA is preparing another experiment involving building hills with varying densities of ground cover and shrubbery, as an investigation into ground water retention.

The Biosphere requires a great deal of electrical power to operate, all the pumps and air coolers and other equipment; more than can be provided from utilities available in this remote place. These five buildings house the electrical generation plant. At the beginning, solar power was considered, but rejected for the high cost and low yield. I still think it's funny that this whole Biosphere 2 project was supposed to demonstrate space colony-like self-sufficiency... but it was anything but.



Our tour group breaks up where we started, in the original Biospherean's dining room. It is 4:30, and the UA is closing it down for the night. We make our way back to our car, and leave for our hour-long drive back home. On the way, we think about visiting Catalina Mountain State Park, just to see what's there, but it starts raining on us pretty hard when we get to the intersection. That's another trip for another day.

So the visit to the Biosphere 2 was certainly interesting, and I'm glad I finally saw it. And that my kids saw it, too, in between poking at each other and being hysterical. I just don't think we will return anytime particularly soon.