

HIGH PROFILE

A new frontier

After two years in Biosphere 2, scientist Linda Leigh sets new course

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SPECIAL TO THE TRIBUNE

For two years, botanist Linda Leigh was literally off in another world.

As a member of the Mission One team of Biosphere 2, Leigh and seven other scientists boldly went where no men and women had gone before—into a manmade biosphere, or living world, created to mimic Earth processes. This sealed terrarium-like environment was closed to Biosphere 1 (known as planet Earth to non-biospherians) for 24 months.

The small world of Biosphere 2, roughly the size of three football fields, is a privately funded scientific experiment and tourist attraction near Oracle, Ariz.

The original \$150-million project was funded by Texas billionaire Edward Bass and other private interests. Space Biospheres Ventures is the entity that runs the Biosphere project, which continues to operate through private funds and tourism revenues. The space-age-design domes of glass and steel were created as a "test tube" for ecologists, space researchers and other scientists.

The four women and four men on the Mission One crew communicated with the outside world by computers, television and telephones. The door was never locked, but they had no visitors inside and never left except for one emergency hospital visit. All eight wore walkie talkies for 24 hours a day for two years.

Leigh, terrestrial ecosystems manager for the project, devoted six years to selecting, collecting and planting more than 2,000 plant

species that thrive in Biosphere 2. Then she spent two years inside, living out the experiment she helped to create.

Since Leigh and her companions emerged last September from their self-contained environment, the botanist/field ecologist has had time to reflect on her experience as voluntary guinea pig. She has resigned from Biosphere 2 to pursue a Ph.D. in planetary ecology, but the soft-spoken Leigh is an outspoken advocate of the often-controversial experiment.

"Biosphere 2 is a metaphor for thinking about planet Earth," she said during a visit to Chicago to deliver the Dean's Lecture at Governors State University.

"I gained a very tangible sense of my own connection to every other part of the Earth," the Portland, Ore., resident said.

"Inside, if someone opened a smelly bottle of glue, it instantly affected the quality of air all through the biosphere. Once someone left a hose on, and our carbon dioxide level was raised overnight as a result.

"We could easily, and quickly, see how every individual really makes a difference."

Outside Biosphere 2 a large support staff monitored the system round the clock. "It couldn't have been done just by eight people," Leigh said.

The project is ongoing, and on March 6 a second crew is scheduled to enter for a 10½-month stay to continue the planned 100-year experiment.

Inside Biosphere 2 are seven ecosystems or biomes, that mirror those of Earth, with living quarters for human beings and land for agriculture. All wastes in



Tribune photo by John Kinggas

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Linda Leigh

the 3.15 acre world were recycled during the Mission One stay, and no additional water was pumped in. Two structures house "lungs," or expansion chambers, for heated air.

"It felt spacious," Leigh said. "There was no reason to have cabin fever."

When Leigh walked out the door of one of the two "human habitats," she could swim in an ocean and visit a desert, marsh, savannah and rain forest, all in a

morning stroll.

Strolls, however, were infrequent. Leigh and her companions were responsible for producing 80 percent of their food supply. (The rest had been stored before entry). Much like early American pioneers, they spent most of their time and energy on basic farming tasks and food preparation in addition to collecting experimental data.

"I didn't need any more exercise than the work we did," Leigh said.

"In fact, many times I was down to 1,750 calories a day, and I was acutely aware of having to stop because I had run out of calories." The slender 42-year-old lost 15 pounds during her stay in Biosphere 2.

A low-fat, low-cholesterol diet was planned, but a limited food supply was not. Biosphere 2 depends on outside light, and when unusually low sunlight levels outside caused low crop yields inside, the Biospherians had to cope. Certain staples, such as beets and sweet potatoes, were plentiful, but "we were hungry most of the time," Leigh said.

"We saved up food supplies so we could have festivals and even invented occasions so we could cook special meals."

But even festival meals had no chocolate and very little coffee.

"We obsessed about food, especially dessert," Leigh recalled. "I asked friends on the outside to fax me menus from restaurants."

"Peanuts, our only snack food, took on real value. When we played poker on New Year's Eve, we played with peanuts. We had no currency."

In fact, Biosphere 2 is a paperless environment. A hose spray replaced toilet paper. Instead of sanitary products, the women used washable rubber cups or natural sponges.

In reflecting on her two years living out an experiment, Leigh assessed the personal and professional impact. The biggest scientific shock, she said, was the drop in oxygen levels from 21 percent to 14 percent. The gradual oxygen depletion had a definite effect on the participants, Leigh noted, casting "a cloud over our spirits and making us crabby, tired, rundown."

"I had to take a breath after every sentence and stop after climbing two steps," she said. When additional oxygen was finally pumped in, she said, "It was such a huge relief, I just ran. And I'm not a runner."

Every problem led to a discovery, Leigh said. The biosphere's oxygen depletion was traced to too much carbon in the rich soil.

"That seems obvious now," she said, "but, frankly, it wasn't obvious then."

"The main thing I learned about myself was that I'm not as easy to get along with as I used to think. I learned the importance of getting into a listening mode to get things done as a group."

Group living apparently had its special challenges, even for eight dedicated scientists.

"I learned that the traits that got on my nerves in the others were the very things I most dislike about myself," Leigh said.

In answer to the inevitable question about romances inside the giant greenhouse, Leigh said the group "had no trouble reaching a consensus that we would not comment on that."

Leigh's advice to the new crew entering Biosphere 2 in March is to spend time playing together.

"Our crew was selected because we were all very task-oriented. We worked well together. But we needed a trickster. The element of play was definitely missing."

What would Leigh herself have done differently?

"I'd create a support network before I went in, make sure all my friends had computer systems so we could be in touch by e-mail or fax. I was in for about a year before I realized how much I needed outside contact and support."

Biospherians had plenty of strangers waving to them from observation windows, but Leigh acknowledged that being watched was not always welcome.

"Sometimes it was great, like on my 40th birthday when the tour guide had everyone sing to me." But other times Leigh would slip away to the rain forest for privacy.

"I would definitely volunteer again, but two years is a long haul," she said.

"The experiment has definitely changed me," Leigh said. "I saw that the oxygen in a rain forest is the oxygen we'll be breathing, so any damage to the rain forest is damage to our own oxygen supply. I had heard it before, but I never realized what it meant until I saw the impact so directly."

"Even if we don't see the effect immediately on Earth because it's so big, it's still the same as inside Biosphere 2. We're all connected to the entire globe."