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UA SCIENCE Biosphere 2

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PROJECT WILL HELP STUDY THE FLOW OF WATER IN AND ACROSS LANDSCAPES

# Work under way in Biosphere 2 on three huge experimental slopes

DAVID SANDERS / ARIZONA DAILY STAR

**Atop a beam, Nate McCollum of Parsons Steel Erectors works to attach a crossbeam for one of the new slopes inside Biosphere 2. The $7 million Landscape Evolution Observatory, or LEO, will help study how water moves through and across various landscapes. "This will be the largest earth science instrument ever built," said John Adams, assistant director of Biosphere 2.**

**By Tom Beal**
ARIZONA DAILY STAR

The University of Arizona is assembling steel frames for three massive hill slopes inside Biosphere 2 near Oracle — a process scientists say is akin to building three giant ships in a bottle.

The steel parts of the $7 million Landscape Evolution Observatory (LEO), and the trucks that carry them, must squeeze through a 10-by-15-foot opening in the steel-and-glass terrarium that was originally built as an experiment in sustaining life in a sealed-off environment.

When assembled, each frame, measuring 40 feet by 100 feet, will be filled with about 3 feet of soil and weigh about 2.2 million pounds.

It is the first large-scale instrument being built at the Biosphere since the UA took over its operation in 2007. It assumed ownership of the 40-acre property in June.

"I'm so excited about this project," Biosphere 2 Director Travis Huxman said by email from Mexico.

"This will be the only place in the world where we can measure the complete hydrologic cycle."

Each slope will be imbedded with more than 2,000 sensors and samplers that will allow scientists to measure what happens when water flows over landscapes. Weight sensors embedded in the steel frame will allow them to precisely account for the water in the soil.

Scientists will be able to vary the temperature and the regular-

## Did you know?

Biosphere 2 has 6,500 windows and is 91 feet at its highest point.

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ity and intensity of precipitation. Eventually, they will add and subtract vegetative cover to assess the role of plants on runoff and soil chemistry.

Planning for the experiment involved scientists from seven UA departments or disciplines — soil, water and environmental science; ecology and evolutionary biology; geosciences; hydrology; water resources; atmospheric sciences; and natural resources.

The UA hopes to attract an array of scientists — and research grants — to its new scientific instrument, which Stephen DeLong, lead scientist for the project, compared to building an astronomical observatory or a particle accelerator.

It will allow earth scientists to conduct experiments on a large scale without losing the precision of a laboratory.

### Biosphere 2 timeline

- **1987-91** Construction of the 3.16-acre structure and support buildings.
- **Sept. 26, 1991** A crew of eight enters the Biosphere and lives in the enclosed artificial environment for two years.
- **1994** Last group of seven lives inside the Biosphere for 6 1/2 months when the administrative decision is made to change the direction of the mission.
- **Jan. 1996** Columbia University of New York City begins management.
- **Dec. 2003** Columbia University relinquishes management.
- **July 2007** University of Arizona assumes management of Biosphere 2 and establishes B2 Earthscience and the B2 Institute.
- **June 2011** UA becomes the owner of Biosphere 2, its adjoining buildings and 40 acres of land.

"It's a whole new thing for the earth science community," said DeLong.

Initial experiments will be performed without vegetation, he said.

Hydrologists and geologists want to observe the patterns and mechanics of water moving through the rock, DeLong said.

Scientists are also interested in learning how the volcanic rock they selected and ground to a homogenous size will weather over time.

The volcanic rock, from the Flagstaff area, was selected for its chemical nature. "It's full of volcanic glass, and the minerals in it are all susceptible to chemical weathering," DeLong said. Olivine, for example, will become clay.

When plants are added, they will probably be desert varieties that survive in unenriched soil, and the climate will be kept fairly warm.

DeLong doesn't rule out colder climates in the future. Biosphere 2 has the ability, he said, to make it cool enough to observe effects of snowmelt.

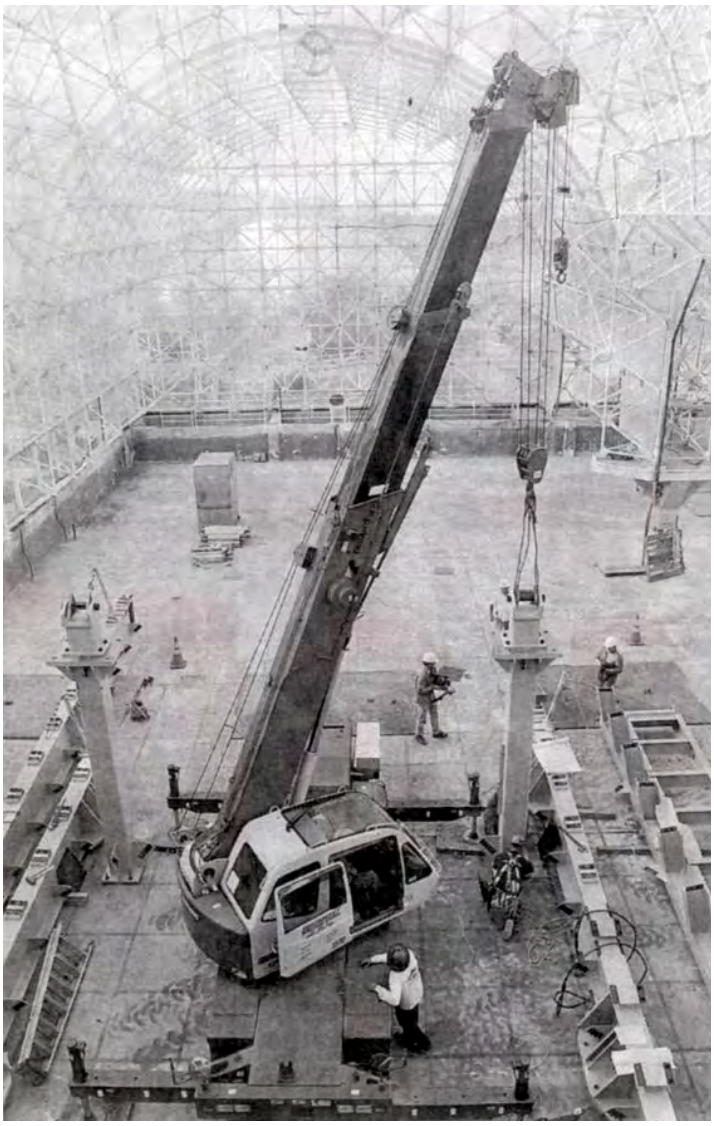
DeLong said the observatory will be able to answer important questions about how watersheds work, and how continued drought and higher temperatures will affect them in the future.

It is being built in the half-acre site where food was grown for the participants in the Biosphere's human experiments. It was called the "intensive agriculture biome."

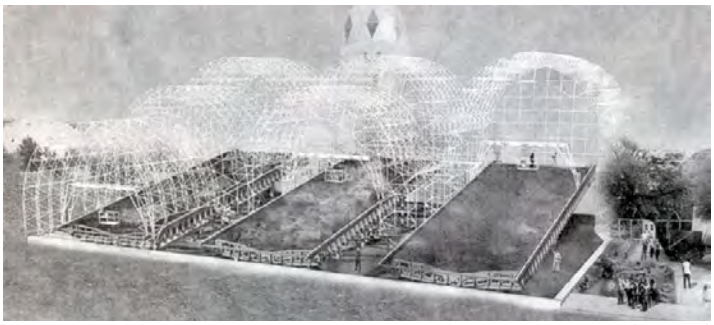
Initial experiments and the cost of building the observatory are funded from a pot of money given by the Philecology Foundation, the charity founded by Texas billionaire Ed Bass, who bankrolled the original construction of Biosphere 2.

Parsons Steel Erectors of Tucson fabricated, and is installing, the steel. Lloyd Construction and M3 Engineering are in charge of building and engineering.

*Contact reporter Tom Beat at tbeal@azstarnet.com or 573-4158.*



**A crane from Parsons Steel Erectors moves a support beam into place inside Biosphere 2. Big equipment had to squeeze into the glass structure.**



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**An architectural rendering shows how the three slopes should look once finished in 2012.**