

## BIOSPHERE 2: A BRIEF HISTORY

# An experiment in place and time

Biosphere 2 is located in scenic high-desert country in Pinal County 20 miles north of Tucson, Arizona. Situated at an elevation of 3,900 feet in the foothills of the Santa Catalina Mountains, Biosphere 2 is at the center of a developed campus that covers 250 acres.

Once a Native American hunting ground, this area was identified for its mining potential in the late 1870s. As more mining claims appeared, a cattle ranch and boarded house were established, and the nearby town of Oracle began to grow.

In the 1920s, a Canadian dentist homesteaded the the Cañada del Oro Ranch, just west of Oracle, on what would become Biosphere 2 property. He lived there until his retirement in 1957, when he sold the to Lady Margaret, Countess of Suffolk. During Lady Margaret's ownership, a Spanish-style home—complete with a pool, servants' quarters and garage—was built. Lady Margaret retained ownership of the ranch until 1968. Today the ranch property surrounds Biosphere 2. The pool has been removed, the

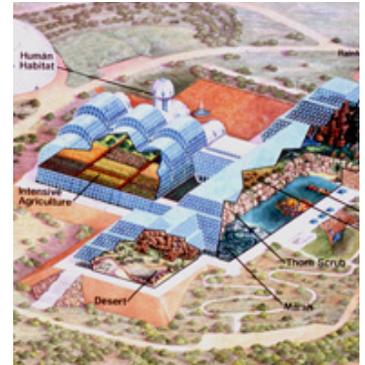
house has been renovated as an administration building (Suffolk House), and other structures have been converted to bungalows for faculty and visitor accommodation.

In 1969, after Lady Margaret's death, the estate was sold to Motorola Corporation. Motorola constructed a management training institute featuring an airstrip, guest suites, meeting rooms and a dining area. In 1979 the property was donated to the University of Arizona Foundation. The Foundation used the property for corporate and educational retreats until 1984, when it sold the property to the founders of Biosphere 2 (Space Biosphere Ventures Inc.).

The next ten years were devoted to the design, construction and initial experiment phases of the Biosphere 2 project. The project's early goals called for the design of an enclosed facility with simulated environments that could be occupied by humans to demonstrate the interconnectedness of humans and the environment. Construction of the

main apparatus began in January 1987 and concluded in September 1991. The first mission lasted from September 1991 to September 1993 in which four men and four women lived inside Biosphere 2's sealed, energy-rich environment, growing all of their food and recycling their air, water and wastes. The experiment was an outstanding success in engineering terms but failed as a sustainable planetary ecosystem analog.

The main factor contributing to a dramatic imbalance in oxygen and carbon dioxide was the abundant microbes living in the extremely rich organic soil of the rainforest and farm areas. The soil supported rapid growth of the synthetic model ecosystems and crops in Biosphere 2, with rice yields as good as the world's best. However, the soil's metabolism was so active that it affected the environment's atmospheric composition. Oxygen was absorbed from the air by soil microbes. These released huge amounts of carbon dioxide from the soil back to the air, exceeding the



photosynthetic capacity of plants to assimilate it and regenerate oxygen. The excess carbon dioxide was absorbed by the structure's unsealed concrete, and oxygen levels declined rapidly. With a leak rate of less than 10 percent per year, this imbalance of oxygen production, so vital for human life, caused the experiment to become unsustainable. A shorter second mission was carried out in 1993-94.

In April 1994, the project owner, Edward P. Bass, brought in new management to restructure the organization and research focus. He invited scientists from Columbia University to serve in an advisory capacity. In January 1996, Columbia University expanded its role and took full responsibility for research, education, and public outreach activities at Biosphere 2. On December 23, 2003, Columbia University discontinued its management of the Biosphere 2.

In July 2007, the University of Arizona assumed management at Biosphere 2 with a vision of understanding complex environmental systems by engaging both the scientific community and the public, integrating large-scale experimentation with computational modeling, and advancing awareness of the environmental and resource challenges. Four years later, the University of Arizona was gifted the 40-acre Biosphere 2 campus and facilities.

