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# *Biosphere 2*

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**October 29, 2008**

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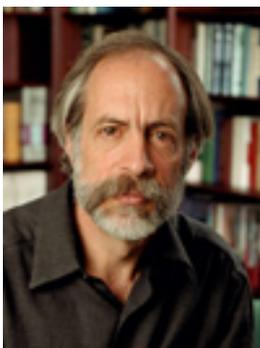
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## **Introduction**

The Information Resource Center (IRC) of the Embassy of the United States in Madrid has prepared this information package for the Digital Video Conference (DVC) on Biosphere2dential Elections 2008 with professors Joaquín Ruiz and Travis Huxman. This DVC is organized by the American Embassy in Madrid and will take place on October 29th, 2008.

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# 1. Joaquin Ruiz



Joaquin Ruiz is Dean of the College of Science and Professor of Geosciences in The University of Arizona

Joaquin Ruiz was named Dean of the College of Science at the University of Arizona in July 2000, after heading one of the most highly ranked geosciences departments in the nation for five years. He earned his PhD from the University of Michigan in 1983, joining the faculty at the University of Arizona that same year. His training and academic career have been interdisciplinary, making him well suited to the culture on the Arizona campus—particularly in the sciences where some of the University's greatest strengths come from interdisciplinary approaches. As a scientist with equal abilities in chemistry and in geology, Joaquin Ruiz has been able to address many first-order problems in the Earth Sciences, such as the development of new isotope systems for studying ore deposits and the tectonic processes involved in the growth and evolution of Mexico. His research team addresses problems ranging from the origin of life to present-day climate change.

## EDUCATION

B.Sc. Geology - University of Miami, Miami, Florida – 1977, B.S. Chemistry - University of Miami, Miami, Florida – 1977, M.S. Geology - University of Michigan, Ann Arbor, Michigan – 1980, Ph.D. Geology - University of Michigan, Ann Arbor, Michigan – 1983

## PROFESSIONAL SOCIETIES

Geological Society of America, Fellow, American Geophysical Union, American Chemical Society, Geochemical Society, Society of Economic Geologists

Source: <http://www.b2science.org/about-b2advisory-ruiz.html>

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## 2. Travis E. Huxman



Director, Biosphere 2 and B2 Earthscience; Associate Professor, Ecology and Evolutionary Biology, The University of Arizona.

Dr. Travis E. Huxman received a Bachelor of Science (1993) and Master of Science (1996) in biology from California State University, San Bernardino. He earned his doctorate in biological sciences from the University of Nevada, Las Vegas in 2000. He was a post-doctoral fellow at the University of Colorado before joining The University of Arizona in Tucson in the department of ecology and evolutionary biology in 2001. In 2007 he became Director of The University of Arizona Biosphere 2 and B2 Earthscience, overseeing the construction of an interdisciplinary research program aimed at tackling the pressing environmental issues facing society. Huxman is a broadly trained biologist who is interested in the evolution of plant traits and the impacts of climate change on ecosystems. He has worked in deserts, grasslands and forests throughout North America, studying the physiological underpinning of how plants grow and reproduce, how climate variability and change affects plant and ecosystem processes and how ecosystem services relate to the human endeavor.

Dr. Huxman is a member of the Global Change Graduate Interdisciplinary Program and also serves on the Advisory Board for the UA College of Science Astrobiology Center and the B2 Institute. He is a member of the newly formed Climate and Hydrometeorology Center and the Institute for the Study of Planet Earth. He has served as a primary advisor to seven Ph.D. students and five post-doctoral fellows, and numerous undergraduate students. He is a member of the Ecological Society of America's Rapid Response Team, the National Ecological Observatory Network's TIGER Design Team for a National Experiment, and the Sonoran Desert Conservation Plan's Science and Technology Advisory Team Monitoring Subcommittee. He is an associate editor for the journals Ecology and Ecological Monographs, and has served on numerous review panels for the National Science Foundation and the Department of Energy. His current research is supported by NSF, DOE (National Institute for Climate Change Research), the Phileology Foundation and Science Foundation Arizona (STARDUST Foundation).

Source: <http://www.b2science.org/about-b2advisory-huxman.html>

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## 3. Biosphere 2

### Mission and Fast Facts



#### Biosphere 2 Mission

To serve as a center for research, outreach, teaching and life-long learning about Earth, its living systems, and its place in the universe.

Catalyze interdisciplinary thinking and understanding about Earth and its future;

Be an adaptive tool for Earth education and outreach to industry, government, and the public;

Distill issues related to Earth systems planning and management for use by policymakers, students and the public.

#### Fast Facts

##### Stats on the Biosphere

##### Biosphere 2 facility

3.14 acre Biosphere facility

7,200,000 cubic feet of sealed glass, 6,500 windows

91 feet at highest point

sealed from the earth below by a 500-ton welded stainless steel liner

40-acre campus

300,000 sq. ft. of administrative offices, classrooms, labs, conference center, housing

##### Name

“Biosphere 2” derives from the idea that it is modeled on Earth, the first biosphere.

##### Elevation

3,820 ft.

##### Visitors, 1991-2007

2,300,000 visitors

325,000 K-12 student visitors

##### Ecosystems under glass

Ocean with coral reef

Mangrove wetlands

Tropical rainforest

Savannah grassland  
Fog desert

## **Mechanics of the Biosphere**

### **The Technosphere**

The basement area of Biosphere 2, known as the Technosphere, covers nearly 3.14 acres. It is where all the electrical, plumbing, and mechanical systems are housed. There are 26 air handlers (AH) located in the technosphere. Of these, 14 are large units that can heat and cool the air, remove particles from the air, maintain humidity levels and generate condensate water (for rain, fog and resupplying the ocean). The 12 smaller AHs can cool the air and generate condensate water. To make condensate water or create dehumidification, the air temperature is lowered below the dew point and this cooled air is blown across the chilled or tower water AH coils. Cooling the air causes condensation to form on the coils, which is collected in drip pans located on the floor adjacent to the handlers.

How an Air Handler Operates: The water temperature required by a biome for creating its climate is manufactured in the Energy Center. Then passed along through an underground closed-loop pipe system, to the proper AHcoils, and is recycled.

### **The Energy Center**

The building with the five arched segments and three towers is the Energy Center complex. The Biosphere 2 laboratory requires continuous power to maintain proper conditions for the living organisms inside and for ongoing experiments.

Temperature rise following power failure on a sunny summer day could within 20 minutes irreparably damage the plants in the Biosphere biomes. The Energy Center responds within minutes to maintain power and to control the environments in the biomes during the frequent power outages due to summer monsoons.

Within the five arches are two large generators. The primary generator uses natural gas for fuel and a back-up generator uses diesel fuel. In addition to the large generators inside this building, there are also boilers to heat water and chillers to cool water. The large towers are used to cool air by drawing it across a column of water.

### **Average monthly temperatures (Oracle, AZ)**

<b>Month</b>	<b>High</b>	<b>Low</b>
Jan	56.8	35.1
Feb	59.6	36.8
Mar	64.8	40.1
Apr	73.4	45.8
May	82.0	53.1
June	91.6	62.3
July	92.1	67.6
Aug	89.3	66.0
Sept	85.7	61.7
Oct	76.0	51.3
Nov	65.9	42.7
Dec	57.6	36.4

## 4. Biosphere 2

### History



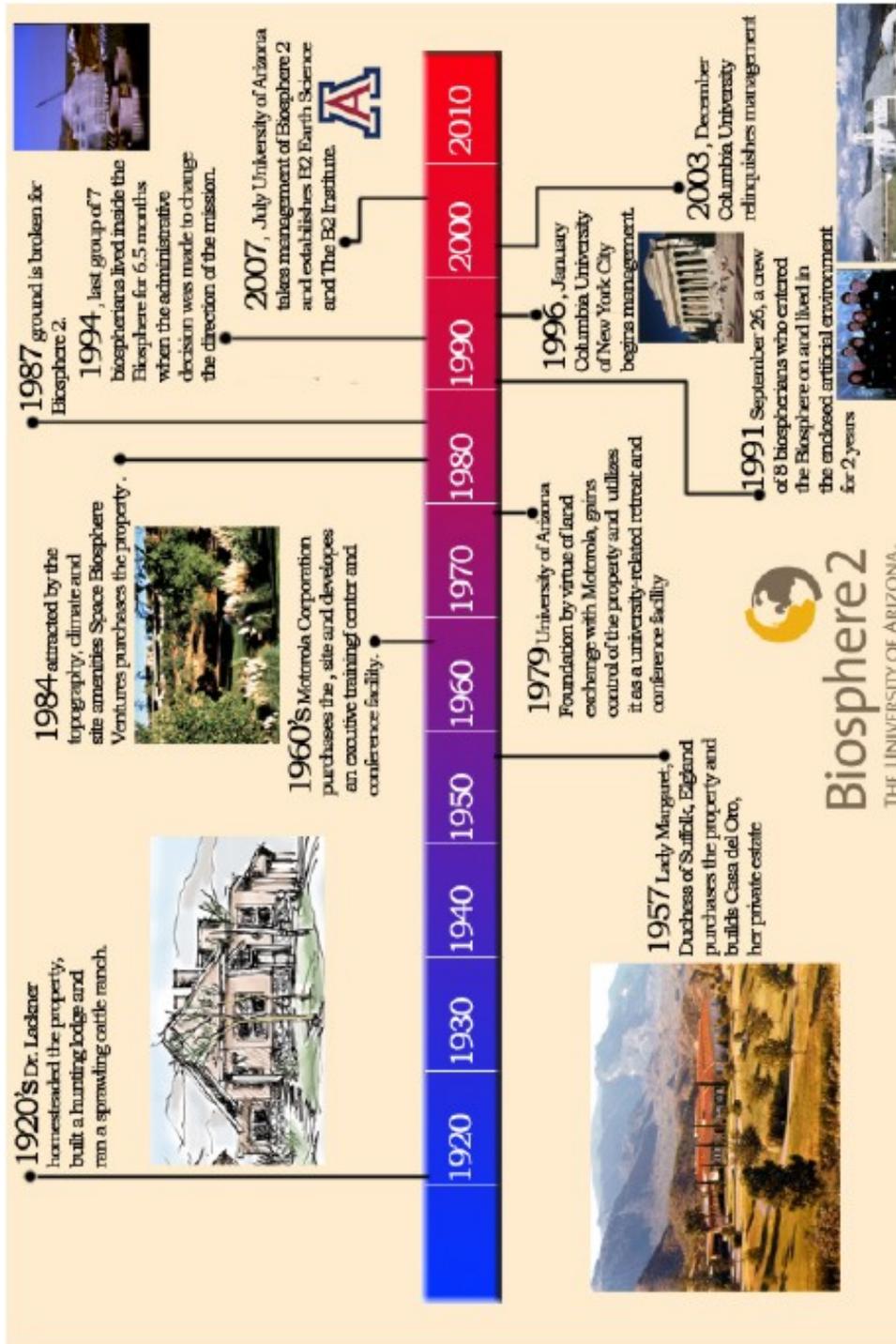
The University of Arizona assumed management of Biosphere 2 in June 2007, with a 3-year lease of the 3.14 acre facility. The agreement to pay a \$100 annual fee to owners CDO Ranching and Development may extend to 10 years.

A \$30 million gift from the Phileology Foundation, founded by Edward P. Bass, funds Biosphere 2's operations and some research projects. Other grants and awards, primarily from the National Science Foundation, also support research activities.

In the 1800s, the Biosphere 2 property was part of the Samaniego's CDO Ranch. After several changes of ownership, it became a conference center in the 1960s and 1970s, first for Motorola, then for The University of Arizona. Space Biospheres Ventures, bankrolled by Bass, bought the property in 1984 and began construction of the current facility in 1986 to research and develop self-sustaining space-colonization technology. Two missions, between 1991 and 1994, sealed Biospherians inside the glass enclosure to measure survivability. Behind this highly public exercise was useful research that helped further ecological understanding. An insider's perspective on this experiment is provided by Jane Poynter, a veteran of Mission I, in *The Human Experiment: Two Years and Twenty Minutes Inside Biosphere 2*.

In 1994, Decisions Investments Corporation took over the property and Columbia University managed it from 1996-2003 and reconfigured the structure for a different mode of scientific research, including a study on the effects of carbon dioxide on plants. It built classrooms and housing for college students of earth systems science.

The property was sold June 4, 2007, to CDO Ranching and its development partners. The enclosure now serves as a tool to support research already underway by UA scientists. As a laboratory for big-scale projects, the university's stewardship of Biosphere 2 will allow the UA to perform key experiments aimed at quantifying some of the consequences of global climate change.



Source: <http://www.b2science.org/about-history.html>

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