

# FINDING THE LOST CITY



**U**bar was a fabled city of ancient Arabia, the hub of a lucrative trade in frankincense, an aromatic resin as valuable as gold because it was used throughout the world of 5,000 years ago for embalming, perfumes and medicines. Grown in the Qara mountains of what is now southern Oman, the frankincense was hauled by camel caravan to Alexandria and Jerusalem and Damascus, thence to the civilizations of the western Mediterranean. Trade made the merchants of Ubar fabulously wealthy and the oasis town grew into a fortress city of fame, often mentioned in Arabian literature. Then, legend has it, Allah destroyed the city because its people had become wicked.

For centuries, Ubar was lost to human view. Many sought to rediscover the "Atlantis of the Sands," as it was called by T. E. Lawrence, whose planned expedition to find Ubar was interrupted by his untimely death. There were several other Ubar quests

**THE USE OF SPACE**

**TECHNOLOGY IN THE**

**REDISCOVERY OF AN**

**ARABIAN METROPOLIS**

**LOST FOR CENTURIES**

**LEADS TECHNOLOGY**

**TRANSFERS IN**

**RESOURCES MANAGE-**

**MENT/ ENVIRONMENTAL**

**CONTROL**

in the 20th century, but it remained for a pair of amateur archeologists from Los Angeles to spark a successful search. They had a big advantage over their predecessors: they enlisted the aid of NASA's Jet Propulsion Laboratory (JPL), the originator and world leader in space digital imaging technology. Space imaging ultimately proved to be the key to finding what its discoverers believe to be Ubar.

The quest for Ubar began a decade ago with Nicholas Clapp, a Los Angeles filmmaker and archeology enthusiast, who spent years culling information about the lost city from extensive research in ancient literature, records and maps drawn more than 20 centuries ago. From years of effort, he acquired a general idea of where to look for Ubar — but it was very general.

Then he learned of NASA experiments in applying orbital remote sensing techniques to archeology, enabling detection of surface and subsurface features not otherwise detectable. He was able to obtain approval for JPL's participation in the search for Ubar.

With the help of George R. Hedges, a Los Angeles lawyer with a background in archeology, Clapp began assembling a team of experts in several fields, including three JPL space imaging specialists: Dr. Charles Elachi, Dr. Ronald G. Blom and Dr. Robert E. Crippen. Dr. Juris Zarins of Southwest



The principals of the expedition to find the lost city of Ubar: second from left, co-leader Nicholas Clapp; third from right, co-leader Sir Ranulph Fiennes; at far right, chief archeologist Dr. Juris Zarins; second from right, NASA imagery specialist Dr. Charles Elachi; center foreground, wearing hat, Dr. Ronald Blom, NASA geologist/imagery specialist.

Missouri State University became chief archeologist. British explorer Sir Ranulph Fiennes was recruited as team co-leader, and he helped arrange financing for the expedition among Omani, American and British backers.

The JPL trio embarked on a multiyear effort that involved analysis of dozens of space images acquired by space sensors flying over the general area identified by Clapp — a portion of the Rub' al Khali, or Empty Quarter, the vast, almost waterless, life-hostile desert of the Arabian peninsula. They

sifted through data obtained by NASA's Shuttle Imaging Radar, whose probing beams are able to penetrate beneath the desert floor and search for sand-covered structures or water. They analyzed images from the U.S. Landsat and French SPOT Earth survey satellites, whose sensors record terrain features in both visible light and in wavelengths not visible to the human eye. Because the space instruments gather data in digital form, it is possible to manipulate the data and computer-enhance the images, thereby bringing out features that ground explorers would not see.

Their exhaustive analysis failed to turn up underground structures, but it did provide a wealth of caravan tracks, some of them clearly ancient because they disappeared for a time under sand dunes, then reappeared. From water availability and other data, they were able to rule out several

possible sites for Ubar and direct exploration by ground teams. The analysts prepared a map of the caravan trails and noted that they converged at a place known as Ash Shisr, near the eastern edge of the Rub' al Khali. Using another space technology — satellite navigation — Dr. Zarins and his ground team found their way to a water well at Ash Shisr and began excavating.

That was late in 1991. Several weeks later, Dr. Zarins announced that the expedition had indeed found structures and artifacts that evidenced the former existence of a splendid city, one that predates any known Arabian peninsula civilization by a thousand years.

The excavators had uncovered the remains of a large octagonal fort with thick walls 10 feet high and eight tall towers at the corners, along with the ruins of a number of buildings inside the fort around the water well. In addition, they had found pieces of Roman, Greek and Syrian pottery, some of it dating back more than 4,000 years.

It may take a long time to validate that the discovery is Ubar, because the fortress was almost totally destroyed. It appears that the city was inadvertently built atop a vast limestone cave that — probably around AD300 — collapsed and brought the city's structures down into a giant sinkhole. It will take years of cautious and sophisticated excavation to probe the site without further damage. But whatever the probes find, it is clear that the expedition scored a monumental archeological triumph and added a new link in the effort to trace the spread of civilization from its origins in Mesopotamia. ●



The picture that pointed the way to Ubar, an enhanced Landsat image showing, at upper left, the sand dunes of the Rub' al Khali (Empty Quarter), and, near center photo by the dry river bed, the village of Ash Shisr, the probable site of ancient Ubar. The clearly visible light colored tracks are modern gravel roads that form a triangle around Ash Shisr. Keen-eyed analysts spotted the barely visible discontinuous and very old tracks converging on the village, suggesting it was once Ubar.