# Shuttle Radar is Key to Sahara's Secrets

Early in 1982, scientists at the U.S. Geological Survey (USGS) in Flagstaff, Ariz., saw some pictures that changed their conception of the Sahara desert's underlying structure. SIR-A, a synthetic-aperture imaging radar system that had flown over the driest part of the Sahara with the space shuttle the previous November, sent back picture-like data revealing a vast network of valleys and smaller channels winding beneath the desert sands (SN: 6/26/82, p. 419).

In the Sahara's super-dry core region, the radar penetrated right through the sand to reveal gravel terraces and river banks surrounding an apparent ancient drainage system. Geologists had long suspected that the remnants of waterways might exist in the region. Isolated patches of water-smoothed gravel are visible on the desert's surface. Stone-age human artifacts are also scattered in the sand, indicating that humans and life-sustaining water sources were once present.

Now, scientists at USGS, in cooperation with the Geological Survey of Egypt and the U.S. Agency for International Development in Cairo, have found that the radar imagery can have significant implications for earthbound geology and archaeology.

They traveled to the Sahara in 1982 and 1983 to find the locations of the valleys lying beneath the 50-kilometer-wide swath of sand that SIR-A peered through. Last February the investigators returned and dug 82 trenches about 3.5 meters into several of the radar-revealed river banks.

"We were exploring one of the last great unknown river systems on earth," says Jack McCauley, chief of the Sahara project. "From a geological standpoint, we found that the fluvial activity that affected this area was more intense than anyone previously recognized." Sediments and other water-related materials that were unearthed indicate that the channels are hundreds of thousands of years old. These former rivers twist their way through valleys that are millions of years old.

"Radar imaging will simplify geologic mapping and exploration for resources," says geologist Carol Breed of USGS, one of McCauley's several colleagues on the project. SIR-A's radar images show that there is water trapped in the Sahara's deep valleys. Where well-drilling was once an expensive and risky operation, "now we can point to a radar map and say, 'Dig here,'" says USGS geologist Gerald Schaber.

Geologists Maurice Grolier of USGS and Bahay Issawi of the Geological Survey of Egypt also took part in the project.

The Egyptian government is in the process of drilling a well in one of the deep rivers uncovered by SIR-A. The U.S. scientists hope to receive samples of the underground material that is dredged up.

Although they trekked to the Sahara on a geological expedition, the scientists also made exciting archaeological finds. They discovered several dozen artifacts when they dug into the ancient river banks, including about six stone axes that resemble those found on the surface. The axes date from approximately 250,000 years ago, according to William McHugh, an archaeologist at GAI Consultants Inc. in Pittsburgh who participated in the fieldwork. Negotiations are underway with Egypt's Department of Antiquities to bring some of the artifacts to the United States for study.

"What we recovered appears to be from campsites where people stopped about a quarter of a million years ago, about the time of *Homo erectus*, to make tools," explains C. Vance Haynes, an archaeologist and geologist at the University of Arizona. Haynes also went on the recent Sahara expedition. The evidence indicates that the filled-in valleys under the sand sheet could have once been roadways out of Africa for early humans migrating to Europe, he adds. An earlier hypothesis that *Homo erectus* gathered in small groups around spring mounds in the desert appears to be wrong, notes Schaber.

"We've only scratched the surface of what is there," says McHugh, who described the findings at the Society for American Archaeology meeting in Portland, Ore., this week. Nevertheless, it is clear that radar imagery "opens up a whole new domain of archaeology," says Haynes. "Buried rivers probably occur throughout Africa."

In addition, it is possible that sediments buried deep in the valleys date back several million years and contain artifacts from that time period. Unfortunately, says McHugh, the sediments are probably about 300 meters below the surface, making excavation unaffordable. Although the stone axes that the scientists uncovered are estimated to be about 250,000 years old, there is a margin of error of about 100,000 years, cautions Haynes. "Dating the artifacts accurately is a real can of worms," he says. They are too old for carbon 14 dating, and the potassium-argon method does not apply to the volcanic material they were made from.

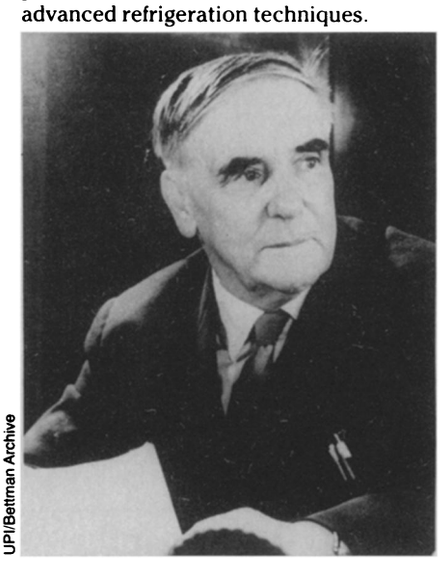
More firmly dated is the space shuttle flight of SIR-B, set for November. Its radar should penetrate deeper and provide expanded coverage of the Sahara and deserts in Peru, South Africa, China and India.

Says Schaber, who recently participated in a preliminary meeting for a 1987 SIR-C mission: "It all makes so much sense now. We've seen how people could live in what has become a hyper-arid desert and migrate through that area. We have new tools for archaeological exploration."

*—B. Bower*

# Pyotr L. Kapitsa, 1894-1984

One of the most famous physicists of the twentieth century, Pyotr L. Kapitsa, died in Moscow, April 8, at the age of 89. Born in the naval base town of Kronstadt near St. Petersburg (now Leningrad) in 1894, he studied under Abraham Ioffe, one of the originators of solid state and low temperature physics, and these subjects became the main theme of his work throughout his life. He discovered superfluidity — total loss of viscosity — in liquid helium at temperatures near absolute zero and invented advanced refrigeration techniques.



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In the 1920s and early 1930s he worked at the Mond Laboratory in Cambridge, England, but while he was visiting his mother in Russia in 1934, his passport was revoked. Stalin wished him to stay and work in the Soviet Union, and to facilitate his research the Soviet government purchased and imported the equipment from his laboratory in Cambridge. He became director of the S.I. Vavilov Institute for Physical Problems in Moscow.

Although never regarded as a dissident, Kapitsa occasionally got in trouble with the government over his outspokenness. The most serious incident was his refusal to work on the Soviet nuclear weapons project, for which he was deprived of the directorship of his institute from 1946 to 1955. He shared the 1978 Nobel prize for physics, and unlike some other prominent Russian Nobel laureates, he was allowed to go to Stockholm to receive it. □