

# Scanning antiquity underfoot

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According to rough estimates, there are some 20,000 undiscovered archaeological sites in Israel waiting to be explored. Currently buried under highways or beneath cities, some could reveal historic monuments from the biblical past and give us clues to the expansion and settlement of modern man as he made his way through the Fertile Crescent.

But where to begin? Who decides which sites should be "dug" — at considerable financial cost — and which should remain unexplored until a later date? A new tool from Prof. Lev Eppelbaum of Tel Aviv University's Department of Geophysics and Planetary Sciences at the Raymond and Beverly Sackler Faculty of Exact Sciences may provide the answer.

Prof. Eppelbaum's new tool combines advanced analyses from many geophysical methods and provides the most conclusive evidence ever produced about what's below the ground's surface. His tool is already being applied at many [archaeological sites](#) in Israel — and it's ready to be used in the United States and at other sites around the world.

## **An overland use for nuclear submarines**

Reported recently in the journal *Advances of Geosciences*, Prof. Eppelbaum's new tool gathers data from a number of sources — including radio transmitters used to communicate with nuclear submarines and detailed magnetic field observations — and applies an original algorithmic approach to the measurements to make sense of what lies below the earth's surface at depths of up to several dozen yards.

His tool can help people "see" meaningful objects, artefacts or civilizations — and lay them out in a four-dimensional chart.

While methods exist for scanning sites of potential archaeological and geological importance, such tools produce significant background noise or inconclusive readings, Prof. Eppelbaum says.

"Inspired by Israel, where we have so many archaeological records underfoot, my tool can also help Americans locate old native burial grounds, and determine minerals and elements several yards below the surface," he continues.

## **A faster road into the past**

His tool can be used to evaluate the possible archaeological significance of any given area under scrutiny. Providing rapid results within days or even hours, the algorithm can "read" extensive data before any digging or exploration begins. Financially, technically and ecologically, this tool offers an optimal way to localize and classify ancient buried objects and estimate the potential of the further archaeological investigations, he says.

Prof. Eppelbaum's solution is called the "multi-PAM," which stands for "physical–archaeological models." The tool first interprets what it "sees" by recognizing image targets; then the interpretation can be used to develop a four-dimensional model which can be presented to archaeologists hoping to explore a particular region.

Placed in a small unmanned airplane hovering several yards off the ground and scanning wide tracts of land along the earth's surface, Prof. Eppelbaum says, the tool can reveal unexplored sites of historical and archaeological significance.

Provided by Tel Aviv University

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