

Speaking of Science

# Maya civilization was much vaster than known, thousands of newly discovered structures reveal

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By **Cleve R. Wootson Jr.** February 3

Archaeologists have spent more than a century traipsing through the Guatemalan jungle, Indiana Jones-style, searching through dense vegetation to learn what they could about the Maya civilization that was one of the dominant societies in Mesoamerica for centuries.

But the latest discovery — one archaeologists are calling a “game changer” — didn't even require a can of bug spray.

Scientists using high-tech, airplane-based lidar mapping tools have discovered tens of thousands of structures constructed by the Maya: defense works, houses, buildings, industrial-size agricultural fields, even new pyramids. The findings, announced Thursday, are already reshaping long-held views about the size and scope of the Maya civilization.

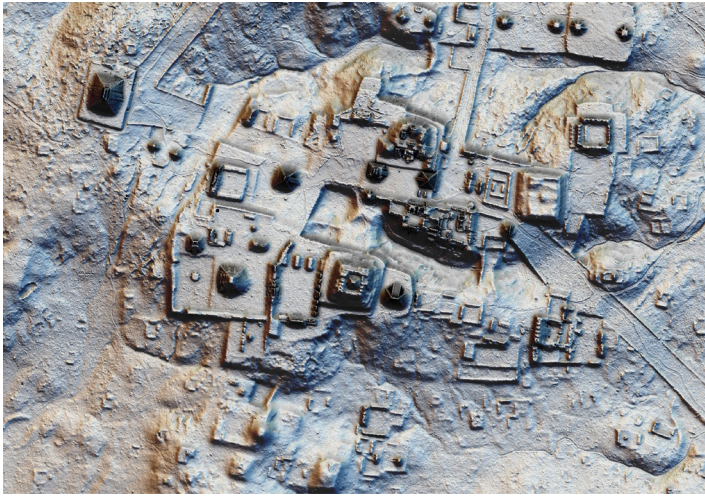
“This world, which was lost to this jungle, is all of a sudden revealed in the data,” said Albert Yu-Min Lin, an engineer and National Geographic explorer who worked on a television special about the new find. “And what you thought was this massively understood, studied civilization is all of a sudden brand new again,” he told the New York Times

Thomas Garrison, an archaeologist at Ithaca College who led the project, called it monumental: “This is a game changer,” he told NPR. It changes “the base level at which we do Maya archaeology.”

The findings were announced by Guatemala's *Fundación Patrimonio Cultural y Natural Maya* (Mayan Heritage and Nature Foundation), also known as PACUNAM, which has been working with the lidar system alongside a group of European and U.S. archaeologists.

The lidar system fires rapid laser pulses at surfaces — sometimes as many as 150,000 pulses per second — and measures how long it takes that light to return to sophisticated measuring equipment.

Doing that over and over again lets scientists create a topographical map of sorts. Months of computer modeling allowed the researchers to virtually strip away half a million acres of jungle that has grown over the ruins. What's left is a surprisingly clear picture of how a 10th-century Maya would see the landscape.



LiDAR image from Tikal, the most important Maya city

Scientists used similar scans to unearth a network of ancient cities in Angkor, the heart of the Khmer empire in Cambodia that includes the famed Angkor Wat, [according to the Times](#). Lidar has the potential to unearth civilizations even in the densest jungles of Brazil.

And Garrison said the lidar data can be used in other fields.

“We don't use about 92 percent of the lidar data. We just throw it out to make our maps,” he told The Washington Post. “But there is incredibly valuable information in that forestry data. You're just seeing the archaeology part because that's what we focused on, but that data can be used to determine how jungles recover from forest fires, what's the carbon footprint.”

Still, that 8 percent of data was as astonishing as it was humbling, he said.

The planes that shot lidar pulses at pieces of the Guatemalan jungle did so in a matter of days, Garrison said. It unearthed Maya structures researchers had literally walked over before, including a temple they thought was a hill.

“There was this fortress in our area,” Garrison told The Washington Post. “In 2010, I was within 150 feet of this thing, which would have been a massive discovery in 2010.”

Using the data, researchers have been able to refine their thoughts about Maya civilization.

According to the Associated Press, researchers now say that as many as 10 million people may have lived in the area known as

That and other newly discovered fortresses indicate that the Maya may have been involved in more conflict — even outright warfare — than previously believed, and at earlier points in history.

“While we’ve known that the Maya practiced warfare, we haven’t see this investment in warlike things,” Garrison said. “Here we have these features at the beginning of the apex of their civilization. That’s really interesting. What role does warfare play in society? Is it actually a catalyst for growth and development?”

Researchers also have a newfound way of thinking about the jungle: as both impediment and preserver.

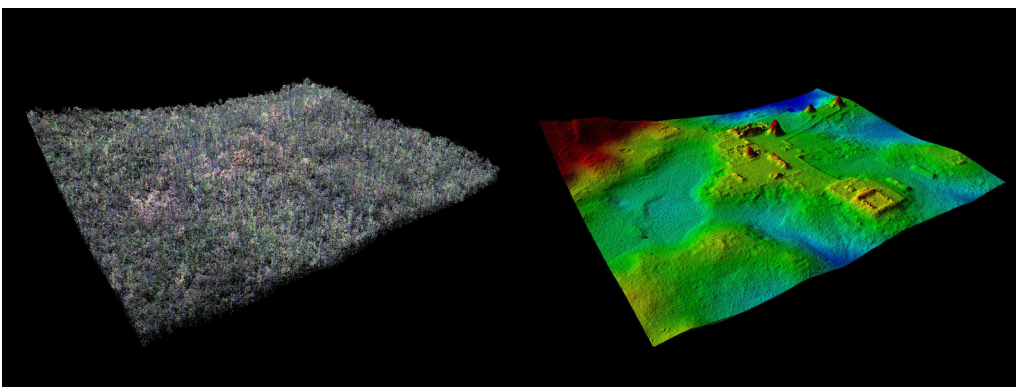
The remains of other cultures have been destroyed by generation upon generation of farming. But after the Maya abandoned their empire in A.D. 900, the jungle grew over abandoned fields and structures.

It hid them but also helped to conserve them.

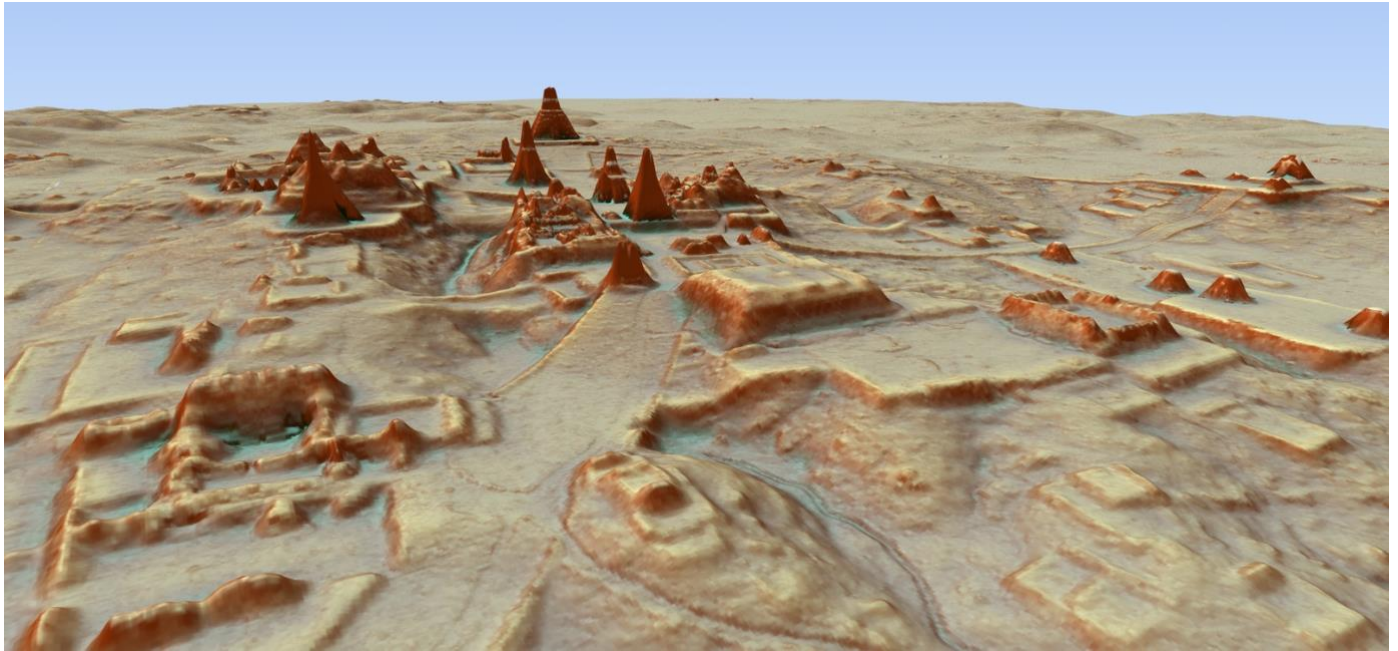
“In this, the jungle, which has hindered us in our discovery efforts for so long, has actually worked as this great preservative tool of the impact the culture had across the landscape,” Garrison said.



A LiDAR image from Tikal, the most important Maya city.  
PACUNAM/Marcello Canuto & Luke Auld-Thomas



Visualization of separate LiDAR layers of the forest cover and of vegetation-free ground surface of the site of El Zotz.  
PACUNAM/Thomas Garrison



A 3D view of Tikal, the major Maya city.

*PACUNAM/Marcello Canuto & Luke Auld-Thomas*