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THINK TANK

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Cybersleuths Take On the Mystery of the Collapsing Colossus

A newspaper headline in the northern French town of Beauvais put the question bluntly: “Will the Americans Save the Cathedral?.” The Americans in this case are a team of architectural historians and computer scientists from Columbia University. The cathedral is the local behemoth: a 700-year-old, extravagant experiment in High Gothic architecture that was once the tallest building in Europe but is now on the World Monuments Fund's list of 100 most endangered sites.

The Cathedral of St. Peter at Beauvais has been in dire straits almost since its inception. In 1284 it collapsed and had to be rebuilt practically from scratch. In 1573, during a service on Ascension Day, a lantern tower perched on the roof fell down. Successive architects tinkered with the design. And the cathedral was never finished: no one ever got around to building the nave.

Today the cathedral is as unstable as it is colossal, its towering five-aisled choir and phalanx of flying buttresses regularly battered by gale-force winds from the English Channel less than 100 miles away. And the French can’t agree on what should be done about it. Some argue that metal and wood supports introduced in 1993 will hold the building together. Others say they are doing more damage than good—calling the cathedral “St. Peter’s in Chains.”

But now the Columbia team has come up with an ingenious idea for resolving the debate: scanning the building. In July two Columbia computer scientists arrived in Beauvais with a laptop computer and a 60-pound black box: a $100,000 3D laser scanner. For 10 days they roamed around the cathedral, recording detailed images of its facade and interior by bouncing a laser beam off its surfaces. They returned to New York City with 75 digital scans, each one containing about a million data points and capturing the building from a different angle.

Maurice S. Luker III / Columbia University

Inside the soaring, 700-year-old cathedral of St. Peter in Beauvais, France, an endangered structure.

The scans are now being processed and stitched together by a powerful computer on the Columbia campus. The goal is to create a digital replica of the building that will serve as a stand-in for the real thing, allowing the Columbia team to perform a battery of tests and to try out strategies for restoration.

“Once we create a computer model, we can do all kinds of structural analysis of the building and figure out the best way to shore it up and figure out where it’s weak,” said Peter Allen, a Columbia computer scientist who is working on the project.

While computer models are now a routine part of new construction, scanning existing structures is a relatively recent development. In part, that’s because sophisticated 3-D laser scanning technology has been available for only about five years.

“Beauvais is the largest, most complex building ever to be scanned,” said Stephen Murray, the Columbia architectural historian in charge of the project. “With this modeling technique we can actually remove the bits of the building that have been added and take it back to its original pre-collapse state.”

Despite its design flaws and disrepair, experts agree that the cathedral is a rare achievement; one 19th-century architectural historian called it the “Parthenon of French Gothic.” Few people know it better than Mr. Murray, 56, who has spent the last four decades under its spell and has devoted an entire book to it: “Beauvais Cathedral: Architecture of Transcendence” (Princeton University Press,1989). As a graduate student at the University of London in the 1960’s, he used to visit France on his motorcycle, spending the first night in Beauvais after crossing the English Channel.

“There never was a cathedral like this before,” he said. “It’s a building that has gone through a dreadful structural history. In the stones of the building, one can read the signs of a fairly tormented life. It’s almost like a book that can be read.”

Though it lacks a Quasimodo, the history of Beauvais, as Mr. Murray tells it, has its share of drama. The pet project of the wealthy and disaffected Bishop Miles of Nanteuil, Beauvais may have been partly intended as an act of defiance against the French crown. Bishop Miles had lose ties to a group of powerful northern barons opposed to the regency of Blanche of Castile, the Spanish widow of Louis VIII and the mother of the teenage Louis IX.

By the time work began on the cathedral around 1225, the barons were in open revolt. First, they tried to kidnap the young king. When that plan failed, they resorted to slander, spreading rumors that Blanche was pregnant by the papal legate, the Vatican’s representative in France. Infuriated, Blanche went to great lengths to dispel them. At one meeting of her council, Mr. Murray writes in his book, she flung off her robe to “show her flat silhouette.”

The bishop’s plan to build a massive cathedral was a means of asserting his independence from the king, Mr. Murray said, adding that the bishop’s successors were responsible for the building’s ultimate, record-breaking height. “They badly wanted this building to go beyond any existing structure that they knew about.”

Finally completed in 1272, with a keystone 152.5 feet high, the choir was taller than both the new cathedral at nearby Amiens and the Pantheon in Rome. It lasted just seven years.

Why it collapsed in a terrific din on a Friday night in 1284 is still something of a mystery. Mr. Murray hopes the computer model may shed some light on that event as well.

“The last thing that almost certainly brought it down was extreme wind,” Mr. Murray said. “But the building was fatally flawed in some way. Conflicting artistic visions in the 13th century certainly contributed. The model will help pin down exactly how it happened and help us figure out what’s going on now.”