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Angkor Wat

The Jungle Temple Complex

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Name: Period: Date:

Angkor Wat: The Jungle Temple Complex

The Khmer Empire and the Rise of Angkor

In the ninth century CE, the Khmer Empire began its ascent to become one of the most powerful civilizations in Southeast Asia. Centered in what is now Cambodia, the empire controlled vast territories stretching across modern-day Thailand, Laos, and Vietnam. At its height, the Khmer Empire governed millions of people across a diverse landscape of river valleys, dense tropical forests, and fertile floodplains that provided the agricultural foundation for its growing population. The Khmer kings drew their authority from a blend of Hindu and Buddhist religious traditions, presenting themselves as god-kings who served as intermediaries between the heavens and the earth. This concept, known as the devaraja or god-king cult, meant that each ruler was considered a living embodiment of divine power on earth, and their temples served as physical proof of their sacred connection to the gods. This divine mandate drove them to construct increasingly elaborate temple complexes that would demonstrate their spiritual power and political legitimacy. Each

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The walls of Angkor Wat are covered in intricate bas-reliefs that stretch for over half a mile, depicting scenes from Hindu mythology, historical battles, and daily life in the Khmer court. These carvings remain some of the finest examples of classical Khmer art ever produced. One particularly famous panel depicts the Churning of the Ocean of Milk, a Hindu creation narrative showing gods and demons pulling a cosmic serpent to churn the primordial ocean, rendered in extraordinary detail across nearly two hundred feet of carved stone. At its peak, the broader Angkor complex was home to an estimated population of nearly one million people, making it one of the largest pre-industrial cities in human history.

The Hydraulic City and French Rediscovery

What made Angkor truly remarkable was not just its temples but the massive water management system that sustained its population. Archaeologists refer to Angkor as a hydraulic city because its entire urban infrastructure depended on an elaborate network of reservoirs called barays, canals, and channels that captured monsoon rains and distributed water throughout the year. The West Baray alone measures five miles long and one and a half miles wide, holding more than forty-five million cubic meters of water. Engineers constructed these reservoirs by building enormous earthen embankments rather than digging below ground level, a technique that allowed water to be distributed to lower-lying agricultural fields through gravity-fed channels without the need for mechanical pumps. The entire system functioned as an interconnected grid, with smaller community reservoirs and distribution channels branching off from the main barays to serve individual neighborhoods and farming districts across the greater Angkor region. This system allowed Khmer farmers to produce multiple rice harvests per year, generating the agricultural surplus that funded the empire's monumental construction projects. The surplus rice also supported a large class of non-farming specialists, including stone carvers, engineers, priests, dancers, and soldiers, whose labor was essential to maintaining both the empire's cultural achievements and its military dominance over neighboring kingdoms. When the water system eventually failed due to a combination of climate shifts and infrastructure neglect in the fifteenth century, the empire collapsed and the jungle slowly reclaimed the city. Prolonged droughts weakened the system, while unusually intense monsoon seasons caused catastrophic flooding that overwhelmed canal walls and silted up critical reservoirs, creating a cycle of damage that proved

impossible to repair. For centuries, Angkor existed primarily in local Cambodian memory and occasional accounts from visiting monks and traders. In 1860, French naturalist Henri Mouhot visited Angkor Wat; his widely read accounts, published after his death, described it as grander than anything left by Greece or Rome. While Mouhot did not technically discover the site, since local populations had always known of its existence, his writings stirred European fascination with the ruins. French colonial archaeologists subsequently spent decades clearing vegetation, cataloging structures, and attempting restorations, though their methods sometimes caused as much damage as they prevented. Early restoration teams used chemical treatments to clean stone surfaces that inadvertently accelerated weathering, and some structural reinforcements introduced materials that expanded and contracted at different rates than the original sandstone, creating new cracks in walls that had survived centuries of jungle growth.

LiDAR and the Hidden Megacity

For over a century, scholars assumed that the Angkor complex consisted primarily of its visible stone temples and the cleared areas immediately surrounding them. Traditional archaeological survey methods, including ground-based mapping, aerial photography from planes, and satellite imagery, had been unable to penetrate the dense tropical canopy that blanketed much of the region. Researchers knew that the jungle likely concealed additional structures, but without a way to see through the forest, the true scope of Angkor remained a matter of speculation and educated guesswork. That understanding changed dramatically in 2012 when an international team of researchers conducted an aerial LiDAR survey of the region. LiDAR, which stands for Light Detection and Ranging, uses laser pulses fired from aircraft to penetrate dense forest canopy and map the ground surface beneath. The aircraft fires hundreds of thousands of laser pulses per second toward the ground, and while most pulses bounce off leaves and branches, enough penetrate gaps in the canopy to reach the forest floor. By measuring the time each pulse takes to return, computers can construct an extraordinarily precise three-dimensional map of the terrain below, effectively stripping away the jungle digitally to reveal what lies hidden underneath. The technology revealed what archaeologists had long suspected but could never prove: Angkor was far larger than anyone had imagined. Beneath the jungle canopy lay the remains of an enormous urban landscape covering more than four hundred

square miles. The LiDAR data showed a precisely planned grid of roads, residential neighborhoods, agricultural fields with sophisticated irrigation channels, and previously unknown temple sites. The scans also revealed evidence of massive engineering works designed to manage water flow across the entire landscape, including embankments, spillways, and distribution networks that dwarfed even the known barays. Subsequent LiDAR surveys in 2015 uncovered additional medieval cities near Angkor that were even larger than initially estimated, including the city of Mahendraparvata on the nearby Kulen plateau, which appeared to be a carefully planned urban center predating Angkor itself by several centuries. These findings fundamentally reshaped our understanding of preindustrial urbanism. Angkor was not simply a collection of temples surrounded by jungle but rather a sprawling, low-density metropolitan area that may have been the largest city on earth during the twelfth and thirteenth centuries. The LiDAR revolution at Angkor demonstrated how modern remote sensing technology could transform archaeological knowledge virtually overnight, and it has since been adopted at dozens of other jungle-covered archaeological sites across Central America, Southeast Asia, and sub-Saharan Africa.

Key Information: Angkor Wat and the Khmer Empire

Feature	Details
Location	Siem Reap province, Cambodia
Date of Construction	Early 12th century CE under King Suryavarman II
Original Dedication	Hindu god Vishnu; later converted to Buddhist use
Moat Dimensions	Nearly four miles in total perimeter length
Bas-Relief Length	Over half a mile of continuous carved wall panels
Estimated Peak Population	Nearly one million people in the greater Angkor complex
LiDAR Discovery Year	2012 aerial survey; follow-up surveys in 2015
Urban Footprint Revealed	Over 400 square miles of planned urban landscape

Case Study: Managing the Waters of Angkor

Dara is a senior hydraulic engineer serving the Khmer king in the year 1180 CE. The monsoon season has been unusually light this year, and the West Baray is only at sixty percent capacity. With nearly one million people depending on the water system for drinking, bathing, and irrigating three annual rice harvests, Dara faces a crisis. He must decide how to ration the remaining water supply across the canal network while still ensuring enough flow reaches the rice paddies to prevent a famine. Several regional governors are demanding that water be diverted to their districts first, and the king's advisors insist that the temple reservoirs remain full for religious ceremonies. Meanwhile, Dara's survey crews have reported that two major canal walls on the eastern network are eroding dangerously, and repairing them would require diverting labor from the rice harvest. If the canals fail completely, entire neighborhoods will flood during the next heavy rain while downstream fields go dry.

1. How should Dara prioritize water distribution between agricultural needs, residential use, and religious ceremonies, and what consequences might each choice create?

2. What does this scenario reveal about why the Khmer Empire's water management system was both its greatest strength and its greatest vulnerability?

Multiple Choice

1. What technology revealed the full extent of Angkor's urban landscape beneath the jungle canopy?

    a) Satellite infrared photography

    b) Aerial LiDAR scanning using laser pulses

    c) Ground-penetrating radar surveys

    d) Traditional archaeological excavation trenches

2. Why do archaeologists refer to Angkor as a hydraulic city?

    a) The city was built entirely on wooden floating platforms over water

    b) The Khmer people worshipped water as their primary deity

    c) Its temples were powered by waterwheels and turbines

    d) Its urban infrastructure depended on elaborate water management

3. What role did Henri Mouhot play in the history of Angkor Wat?

    a) He led the first large archaeological excavation of the temple complex

    b) He was the first European to set foot at the site

    c) He published widely read accounts that sparked European interest

    d) He translated the bas-relief inscriptions into French

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ Bas-relief	A) An urban center whose infrastructure and survival depend on an engineered water management system
2. ___ Baray	B) A sculptural technique where figures are carved to project slightly from a flat background surface
3. ___ LiDAR	C) A large artificial reservoir used by the Khmer to store monsoon rainwater for year-round use
4. ___ Hydraulic city	D) A wide water-filled trench surrounding Angkor Wat that measures nearly four miles in length
5. ___ Moat	E) Remote sensing technology that uses laser pulses from aircraft to map ground surfaces through vegetation

Fill-in-the-Blank

1. Angkor Wat was dedicated to the Hindu god _____ by King Suryavarman II.

2. The 2012 _____ survey revealed over 400 square miles of urban landscape.

3. The Khmer Empire's massive reservoirs called _____ stored monsoon rainwater.

Short Answer

Answer each question in 2-4 complete sentences.

1. Why is it inaccurate to say Henri Mouhot discovered Angkor Wat?

_____

_____

_____

2. How did the LiDAR surveys of 2012 and 2015 change our understanding of Angkor?

3. What factors led to the decline of the Khmer Empire and the abandonment of Angkor?