

# SCANNING HISTORY

Legacy of Lost Civilizations



**BIG**  
MEDIA

ORIGINAL SERIES

**Scanning History takes us from the field to the lab to show how advances in technology are introducing the tools of the future to the study of the past...**

## **OVERVIEW:**

An archaeological revolution has been taking place with data, artificial intelligence and technology at its beating heart revolutionizing our study of the past. By bringing together cutting edge technology, powered by ever more powerful AI, combined with the traditional tools of the trade we are able to push forward our understanding of some of the world's greatest civilisations.

Where archaeologists once excavated ancient ruins with little more than a spade, oral texts, haphazard plans, and a map to guide them, now they have detailed satellite photography, digital imaging, 3D technology, isotope analysis, tomography and mass spectrometry! This series explores these massive changes using on-the-ground case studies, with access to the archeologists at the forefront of this change and dig site data we will show how each new tech is pushing the boundaries of archaeological discovery and our understanding of what once was, casting a new light on ancient Civilizations and our shared past.

**Scanning History will combine the best elements of a history series and science and technology documentary to showcase revelatory discoveries by some of Europe's top institutions**

## **EPISODE STRUCTURE:**

Scanning History will combine the best elements of a history series with a science and technology documentary series to showcase recent revelatory discoveries by some of the world's top institutions. Each episode will start by setting the scene; taking the audience by the hand and providing an accessible first step back to the subject in hand. For example, at the Battle of Teutoburg we would set the scene dramatically, introducing the audience to what hung in the balance at this critical stage in European History. We will use CGI scans and sophisticated maps to introduce the archeological area of study, and set out what we have known to date and how that was determined. We then dig into the science, showcasing the particular piece of technology that has allowed these recent breakthroughs and how that has compared to the slower, traditional methods. Throughout the episode we will balance the technological with the historical, always showing how our new understanding of the past has been shaped by recent advances in the science of the future.

# CONFIRMED EXPERTS:

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Mark is Professor of Earth System Science at the University College London. He has written eight popular books, over 60 popular articles (e.g., for New Scientist, The Times, Independent and Guardian), appeared on radio and television (including Time Team, Newsnight, Dispatches and Horizon on BBC). His popular book “Climate Change: A Very Short Introduction” by Oxford University Press is now in its fourth edition and has sold over 50,000 copies.



Rebecca is an award-winning researcher and broadcaster focusing on the archeology and cultures of the Middle East and Africa. Her diverse work has appeared on the BBC The New York Times, Al Jazeera, PBS and Channel among others.



Professor on Near East Archaeology and Archaeological Data Science at UCL has worked in the field extensively in the Middle East, Asia and Latin America and writes on Data science; Machine learning; Complex adaptive systems; Computational Social Science; Image analysis and computer vision techniques.



Brenna is a biological anthropologist and archaeologist. She writes books for popular audiences on bones and teeth including ‘Built on Bones: 15,000 Years of Urban Life and Death’ and ‘Growing Up Human: the Evolution of Childhood’.



# Episode 1:

## Akkadia: Decline of the The First Empire

- **Location:** Iraq, Syria, and the Arabian Peninsula
- **Civilization:** Akkadian
- **Tech Deployed:** Biochemical research, archaeobotanical analysis, and human bones.
- **Discovery:** The real reason for the decline of the world's first Empire. **Climate Collapse, Meteors, Volcanoes or Politics and War.**

### **SYNOPSIS:**

Over 4,500 years ago the first major known empire rose in the fertile crescent, between the Tigris and the Euphrates rivers. The Akkadians, led by Sargon to the Great, dominated the valley, replacing the Sumerians and extending their influence to Syria in the north and Oman to the south. The Akkadians brought irrigation and organized agriculture to the region, increasing crop yields and creating an efficient form of bureaucracy. But only 2 centuries later they were in decline. Their marvelous cities were abandoned and in a few short years covered in sand and populated by nomadic herders.

But what happened to the first empire? Theories have ranged from a massive volcanic eruption to a meteorite crash or an economic crisis brought about by war or a drought created by a local climate shock.

Cutting-edge carbon and nitrogen isotope analysis in bones and teeth of inhabitants of three sites from before and after the time of the Akkadian Empire in northern Mesopotamia show no significant or sudden impacts. The Akkadians survived these changes, they adapted, and they continued to live in the lands they owned but slowly their control loosened, they could no longer manage their lands and other tribes rose to claim what was taken by Sargon.

# Episode 2:

## Baiae: Italy's Las Vegas/Atlantis

- **Location: Bay of Naples**
- **Civilization: Roman**
- **Tech Deployed: Acoustic Remote Sensing and Internet of Things,**
- **Discovery: A Roman City that housed the great and the good of Roman society - submerged beneath sea and sand and perfectly preserved.**

### SYNOPSIS:

Baiae was a fashionable Roman resort for centuries in antiquity, visited by many notable Roman figures such as Gnaeus Pompeius Magnus (also known as Pompey the Great) and Julius Caesar. Baiae was noted by Sextus Propertius, a poet of the Augustan age during the 1st century BC, who wrote that the city was a “vortex of luxury” and a “harbor of vice”.

Due to the position of the city on the Cumaean Peninsula in the Phlegraean Fields which the Romans believed was the home of the Roman god of fire, Vulcan), local volcanic activity has meant important parts of the city being submerged beneath the sea. Now with high-frequency acoustic mapping, combined with surface imaging and multibeam sonar, we can reveal a detailed reconstruction of archaeological features on the seabed that will allow archaeologists to start to refine the overall mapping and measurements of the submerged remains at Baia.

Baiae is now one of the world's few underwater archaeological parks, which has since become known as the Las Vegas of the Roman Empire. As it provides a protected marine area, the site must be monitored by AI algorithms that adapt to sea conditions and the system can now include images and information on water quality, pressure, and temperature, as well as details of metal, chemical, and biological elements, and even noise, currents, waves, and tides.

# Episode 3:

## Tracking the Amber Road

- **Location: From the Baltic Sea to the Mediterranean**
- **Civilization: German and Celtic**
- **Tech Deployed: Aerial LiDAR Scanning, GIS analysis**
- **Discovery: The legendary Amber Road**

### SYNOPSIS:

One man's lifetime obsession to uncover the most important trade route of the late Middle Ages that ran the length of Europe.

Europe's communication network in rural areas predominantly consisted of unpaved routes before the eighteenth century. Certain parts of the network were transformed gradually into the roads we all now use to traverse our continent by car, but the majority of the old routes from a network abandoned during the Middle Ages (or even earlier) are currently being discovered using new technology combined with a very human understanding of transportation.

Analyses of the precise digital elevation models, derived from LIDAR data, can reveal the distinct pattern of an old route network quite often interacting with other geomorphological phenomena (e.g., landslides, streams) or old human constructions (e.g., fortified settlements). General erosion impacts, the degree of incision of the old transportation lines, can also be quantified through analyses of digital elevation models taking into consideration the former and new, incised, surface.

When these analyses are combined with mapping and detailed research we can begin to rebuild a picture of the Amber Road, the heart of continental European trade.

# Episode 4:

## Unfolding the Past

- **Location: Jerash, Jordan**
- **Civilization: Arabic, Hellenic, and Early Christian**
- **Tech Deployed: high-resolution micro-computed tomography and 3D scanning**
- **Discovery: A Mysterious spell written in corrupted Arabic reveals how early language began to be adopted and developed.**

### SYNOPSIS:

Jerash, founded in the Hellenistic period, thrived throughout the Roman to the Early Islamic period until an earthquake hit the city in 749 CE. According to legend, the city was founded by Alexander the Great when veterans, who had served under the Seleucids resettled here.

The Jerash Silver Scroll employs two different scripts but the main one is pseudo-Arabic and served magical purposes to cast a spell on someone but at this point, the Arabic language had not yet been fully adopted the scroll shows that Arabic had begun to be an attractive cultural marker. The Jerash Silver Scroll represents one of the objects that give insight into continuing cultural traditions on the one hand and traditions that changed slowly as a new language, religion, and culture began to form and flourish in the Middle East. We will use the Jerash scroll to jump to other scrolls we can now decipher which is rapidly opening up our understanding of other past civilizations, not least the Romans and Greeks with the AI Program Ithaca.

A team of scientists at LMU Munich in Germany has used DeepMind AI to translate 300,000 lines of ancient Persian text via an algorithm that pieces together fragments to make them understandable. We will look into deep learning algorithms and neural networks which will allow AI to make increasingly accurate predictions about the meaning of ancient texts with hopes one day to crack one of our biggest linguistic mysteries and the text of the Minoans.



# Episode 5:

## Ireland's Age of "God Kings"

- **Location:** Newgrange, Ireland
- **Civilization:** Neolithic
- **Tech Deployed:** Archaeogenetics
- **Discovery:** 2020



### SYNOPSIS:

DNA has been used to confirm the existence of an elite social class in the Stone Age Ireland, similar to those found among the pharaohs of ancient Egypt and the "god-kings" of South America's Inca Empire.

A key piece of evidence comes from an adult male buried at the 5,000-year-old Newgrange monument in Co. Meath, Ireland. The team headed up by Dr Lara Cassidy were able to extract DNA from the petrous bone of the ancient corpse, a dense part of the inner ear. Ancient DNA is only preserved well in the body's densest bones, making the petrous portion an ideal extraction point. By sampling the hard-rock bone using a grinder they were able to place the bone shavings in a solution that releases DNA from the bone; allowing them to sequence the entire ancient human genome.

After sampling 44 whole genomes, they were able to reveal that the adult man's parents were first-degree relatives - brother and sister or parent and child. Evidence of incestuous unions like that found at Newgrange is rare in human history; they are taboo for interlinked biological and cultural reasons. Where they do occur, it is often within royal dynasties that have been granted divine status. Brother-sister or parent and child marriages paired with the construction of extravagant monuments are usually indicators of a royal lineage, similar to Tutankhamun's parents who are thought to have been full siblings. And with Newgrange being older than Stonehenge and the Pyramids of Giza, the fact the man's remains were laid in a richly decorated recess in the inner chamber, suggests he was one member of an expansive 'clan' that were buried at impressive stone monuments across Ireland.

# Episode 6:

## The Silver Mines of Europe

- **Location: Saxon Germany and Bohemian Czech Republic**
- **Civilization: Middle Ages**
- **Tech Deployed: LiDAR, Laser Scanning, AR, VR and Unreal Engine**
- **Discovery: 2020**

### SYNOPSIS:

The Ore Mountains on the border of the German federal state of Saxony and the Czech Republic have constituted one of the major sources of ores in Central Europe, best known for its rich deposits of silver and tin. The earliest documented mining operations were the rich seams of silver ore in the region of Freiberg in 1168. Recent scans have indicated much older mining, exploiting deposits of tin ore in the Bronze Age as far back as 2500 BC from where tin mining knowledge was passed to Brittany, Cornwall and Iberia by 2000 BC. With the recent discovery of two large mediaeval silver mines at Dippoldiswalde and Niederpöbel it had become clear mining was more widespread than previously documented. Airborne LiDAR scans were deployed to scan the general area over 5 regions and 2 countries. After identifying points of interest in the LiDAR, physical identification was aided by the use of handheld GPS-receivers. This was later augmented with laser scanning with AR and VR visualisation and unreal engine to bring the interiors of these vast mining complexes to life.

The Ore Mountain region was the setting of the earliest stages of the early modern transformation of mining and metallurgy from a craft to a large-scale industry, a process that preceded and enabled the Industrial Revolution. Mining towns are not “naturally” evolved but “artificially” established, and the Ore Mountains are a special phenomenon. They were founded by locators at the turn of the Middle Ages, after the local wealth of natural resources were discovered. Public buildings were invented, such as town halls, schools, markets, spas, as well as breweries, craft workshops, etc. As the towns evolved, they were regulated according to guilds. Emerging hygiene and defence problems led to the emergence of the first “urban designers” builders, geometricians, soldiers, fortification experts, and artists. Millers and pond-builders laid down the foundations for professional hydraulic management; charcoal burners, craftsmen, ore processors, weavers and other processing trades formed the core of future manufactures and then industries. The development of towns and villages, new construction projects and trades were generating demand for the production of timber, construction stone, ceramic clays for bricks and ceramics, metallic ores, and sand. The first intentional water transfers occurred; wetlands and fields were drained and watercourses were canalized and bridged; an “imperial” road network allowed heavier cart traffic. The pathways to the modern future all emanated from this single site.

The background is a complex, abstract digital composition. It features a dark, textured surface with a grid pattern that recedes into the distance, creating a sense of depth. Overlaid on this are numerous glowing lines and beams of light in vibrant colors: bright orange and yellow, deep blue, and magenta. These lines vary in thickness and orientation, some appearing as sharp, straight paths while others are more diffuse and blurred, suggesting motion or data flow. The overall effect is that of a futuristic, high-tech environment, possibly representing a data center or a digital network.

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