

Secrets of the Red Snake

The great wall of Iran revealed



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A view from the air reveals the true proportions of the 'Red Snake': photo of fort 7 with its massive platform and the associated ditch.

The enigma of the 'Red Snake'

Revealing
one of the World's
Greatest Frontier Walls

PHOTOGRAPH: Georg Gerster/Panos Pictures



It is longer than Hadrian's Wall and the Antonine Wall taken together. It is over a thousand years older than the Great Wall of China as we know it today. It is of more solid construction than its ancient Chinese counterparts. It is the greatest monument of its kind between central Europe and China and it may be the longest brick, or stone, wall ever built in the ancient world - and yet few have ever heard of it. This wall is known as 'The Great Wall of Gorgan' or 'the Red Snake'. An international team of archaeologists has been at work on the snakelike monument and here they report on their findings.

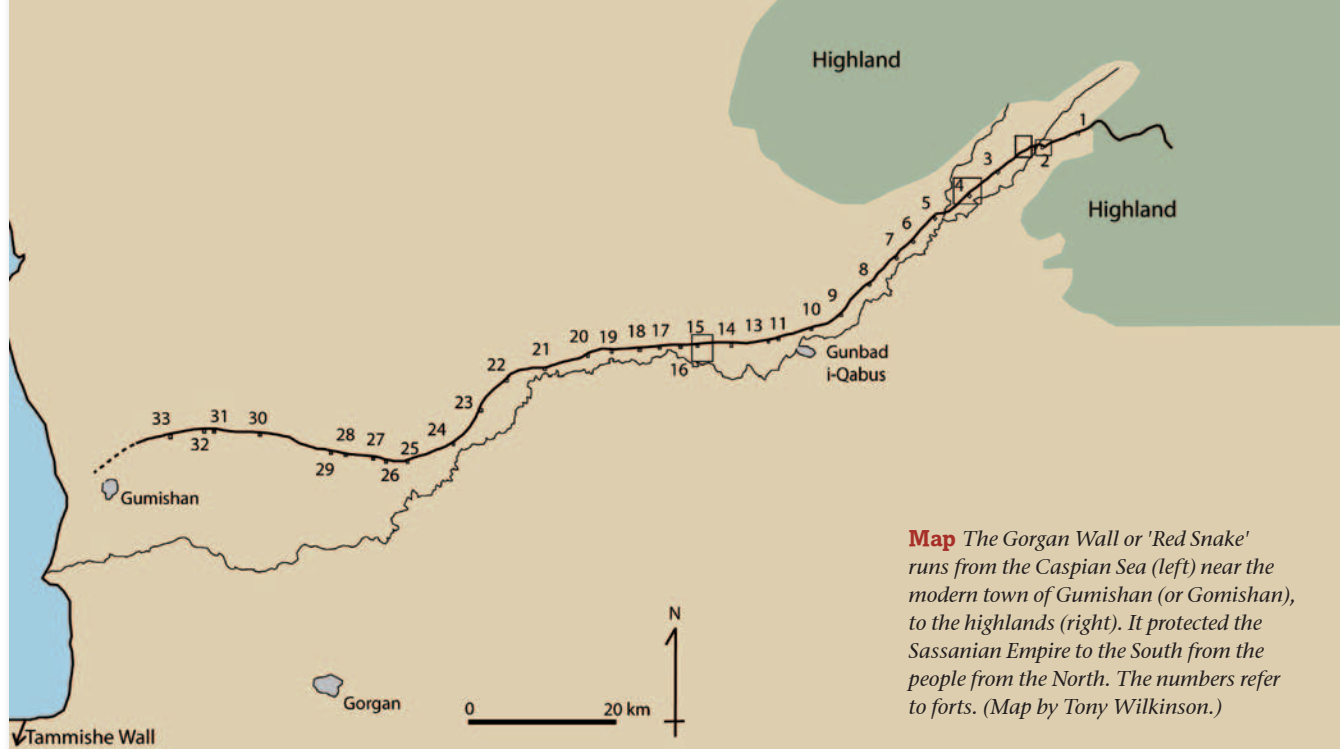
The 'Red Snake' in northern Iran, which owes its name to the red colour of its bricks, is at least 195km long. A canal, 5m deep or more, conducted water along most of the Wall. Its continuous gradient, designed to ensure regular water flow, bears witness to the skills of the land-surveyors responsible for marking out the Wall's route. Over 30 forts are lined up along this massive structure. Their combined size is about three times that of those on Hadrian's Wall. Yet these forts are small in comparison with contemporary fortifications in the hinterland, some of which are around ten times larger than the largest Wall forts. The

'Red Snake' is unmatched in so many respects and an enigma in yet more.

Who built this defensive barrier of awesome scale and sophistication, when, and for what reason? Even its length is unclear: its western terminal was flooded by the rising waters of the Caspian Sea, while to the east it runs into the unexplored mountainous landscape of the Elburz Mountains.

An Iranian team, under the direction of Jebrael Nokandeh, has been exploring this Great Wall since 1999. In 2005 it became a joint Iranian and British project. Our aim: to answer the fundamental questions of when, who, and why. ➔

Above Most of the Wall has been robbed out, but in this section, excavated in 2005, it survived to a height of 1.47m.



Map The Gorgan Wall or 'Red Snake' runs from the Caspian Sea (left) near the modern town of Gumishan (or Gomishan), to the highlands (right). It protected the Sassanian Empire to the South from the people from the North. The numbers refer to forts. (Map by Tony Wilkinson.)

No ancient textual source refers to the Wall, no inscription, and no coin has ever been found on it. With respect to the 'when' question, rather than basing our dating on historical guesswork, we felt that we needed to obtain independent scientific dating.

Dating the Enigma

So when was the Wall built? Some thought it was erected under the Macedonian king Alexander, who reached the area in 330 BC, but died seven years later - indeed the Wall is also known as 'Alexander's Barrier'. Others suggested it was built as late as the 6th century AD under the great Persian king Khusrau I. (AD 531-579). Owing to his 1970s fieldwork, Muhammad Yusof Kiani, and many scholars thereafter, have favoured a 2nd or 1st century BC construction. Who was right?

Fortunately the Wall's engineers had used construction techniques eminently suitable to modern dating techniques. Running mostly through a landscape of windblown loess and, in sections, treeless steppe, there was no sufficient

supply of stone or timber for construction purposes. The loess, however, was an ideal material to produce tens, if not hundreds, of millions of fired bricks. Each of them was square and of standardised size: 37cm diameter in the west of the Wall, 40cm in the east and some 8cm to 11cm thick. These huge bricks were produced on an industrial scale. Our surveys indicate that brick kilns line most of the Wall. In some areas we found kilns under 40m apart, in others almost 100m. Overall there were probably several thousand brick kilns built for the sole purpose of creating the ancient Near East's greatest linear barrier.

Could the kilns yield the evidence we needed to date the monument? If they used wood fuel they would have left charcoal, a material suitable for radiocarbon dating. Furthermore, a kiln seemed a promising candidate for a second independent technique: optically stimulated luminescence (or OSL) dating. Each time sediments are exposed to direct sun light or, in our case, heated up by fire, the luminescence clock is set back to zero. This allows for them to be OSL

Below In the west the wall runs through arid lands. The settlement mound in the background, some 300m north of the Wall, was incorporated into the defensive system through a loop-shaped extension of the Wall.





Above *Where was the Wall's eastern terminal? Team members follow a brick scatter from the robbed-out wall that runs along the upper edge of a ravine to the overhanging rock in the background. Some believe the Wall may have continued beyond and further into the Elburz Mountains.*



Left, top *The vicinity of the kiln (on the slope to the right; not visible) provided all that was needed for brick production: suitable soil, an abundance of fuel (charcoal analysis has shown that scrubs were growing in the area in antiquity as today) and water from a mountain stream.*



Left, below *A section of the 2m thick Gorgan Wall or 'Red Snake' with the brick kiln next to it.*

dated, which in turn promised to reveal when the kilns had last been used.

With these possibilities in mind, in September 2005 we ventured to the vicinity of the Wall's easternmost known point in the foothills of the Elburz Mountains, where a kiln had been located in a previous survey. Our chosen kiln seemed particularly suitable: it was just 13-20m away from the Wall, and it was on a slope without traces of settlement of any other period and so steep that it was sometimes difficult to gain a foothold when excavating it; we could thus be certain that it had been constructed specifically for burning bricks for the Wall - and it is unlikely anybody would have re-used it at a later date. Soon we established that it had virtually identical dimensions to a kiln excavated in the 1970s over 60km further west and also next to the Wall. Our kiln and the others known so far were designed for 10 stacks of bricks sideways, and 17 to 18 lengthwise. They were all replicas of a single prototype - powerful evidence that the Wall-builders were behind the standardised design.

Sediments washed down the steep slope had preserved our kiln remarkably well. Its eleven arches survived on the hillside to their full height of two metres, not counting another metre of superstructure. Two collapsed ➡



Above The kiln under excavation.



Left Dr Jean-Luc Schwenninger measuring the background radiation for his OSL samples. Note the kiln's fire-reddened bottom and the 2m high arch.

Below A brick kiln next to the Tammishe Wall. Its lush and fertile landscape would have been well worth defending.



arches offered an opportunity to dig a sondage into the interior without destroying any preserved architecture. Eventually we reached a dark layer of charcoal and, immediately underneath, the kiln's fire-reddened bottom. We had achieved our goal. Dr Jean-Luc Schwenninger and Dr Morteza Fattahi, of the Universities of Oxford and Tehran, flew in to take OSL samples in October 2005. They also sampled various sections of the Wall itself and of a second shorter wall further west (the Wall of Tammishe) as well as a kiln next to it that we had also excavated. We impatiently awaited the results.

The OSL and radiocarbon samples demonstrated conclusively that both walls had been built in the 5th or, possibly, 6th century AD.

The White Huns

With the benefit of hindsight it is easy to see why the walls would have been constructed at this later date. It was near the northern boundary of one of the most powerful empires in the

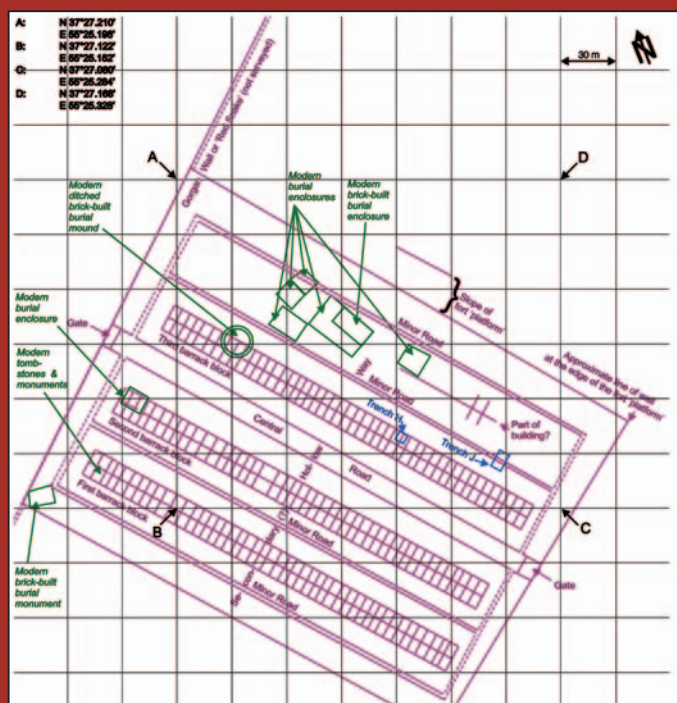
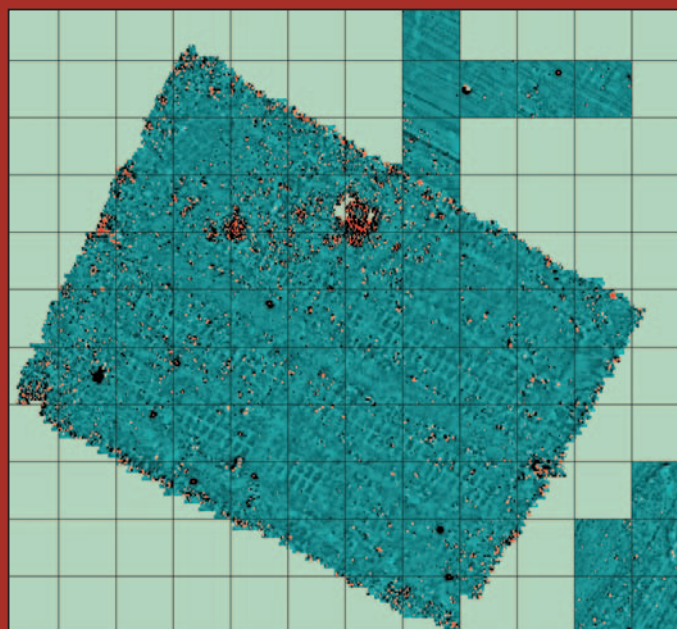


ancient world, that of the Sasanian Persians. Centred in modern Iran, it also encompassed the territory of modern Iraq, stretched into the Caucasus Mountains in the north-west and into central Asia and the Indian Subcontinent in the east. The Persian kings repeatedly invaded the Eastern Roman or Byzantine Empire. Yet, they also faced fierce enemies at their northern frontier. Mountain passes in the Caucasus and the coastal route along the Caspian Sea were closed off by walls, probably to prevent the Huns from penetrating south. Those further east may have been directed against the Hephthalites or White Huns. Ancient writers, notably Procopius, provide graphic descriptions of the wars Persia fought in the 5th and 6th century against its northern opponents. We know that the Persian king Peroz (AD 459-484), when campaigning against the White Huns, spent time repeatedly at ancient Gorgan (next to modern Gonbad-e Kavus, the site of our base camp just south of the Wall). Eventually he had to pay with his life for venturing into the lands of the White Huns. It would have made perfect sense for Peroz, or perhaps another Persian king shortly before or after, to protect the fertile and rich Gorgan Plain from this northerly threat through a defensive barrier.

Discovery of Massive Buildings

Important questions still remained unresolved: was the Wall a heavily defended frontier for centuries - or an ambitious engineering project, perhaps abandoned after no more than ephemeral use? Fort 4, some 14 acres (5.5 ha) large, was selected for magnetometer survey in 2006. To our amazement, Roger Ainslie's highly sensitive equipment revealed three buildings of c.228m length. So much detail was visible on the plots that that we could see individual rooms. The regular layout suggests that they served as barrack blocks. We started to excavate. ➡

Below The 200m small side of the massive fort platform of fort 4. Note the human scales (between the cows and closer to the fort).



Top Until 2006, nobody knew what the interior of a Sasanian fort looked like. The magnetometer survey of fort 4 revealed three c.228 m long buildings – almost certainly barrack blocks. (By Abingdon Archaeological Geophysics and the ICHTO, notably Roger Ainslie, Hamid Omrani and Mohammad Ershadi.)

Above The results of the survey: ancient Persian features (c.5th-7th century AD) in pink, more modern features in green, and our archaeological trenches in blue. Note that certain details, e.g. the precise location of some minor roads and some room divisions, are hypothetical.



Left Most clearly visible in section: the 1.20m wide mud brick wall separating two rooms in a barrack block in fort 4 survives to a height of 3.30m (trench H).

Above The impressive build-up of occupation debris in one of the two trenches in fort 4 (trench J) shows that it was intensively occupied for a significant period of time. Note the road with the gully beside, as well as ovens, a brick paving and possible wells (the latter explored in the sondage).

Below Magnetometer survey at sunrise. The eastern walls of Qaleh Kharabeh are on the left, the citadel in the background background on the right.

Where the magnetometer survey had pinpointed a room division, we found a massive mud brick wall, 1.20m wide and surviving to a height of c.3.30m. Originally, the buildings must have been much higher, as their collapsed remains still form distinctive mounds today. Satellite images show that fort 4 was not a one-off, but that numerous other forts on the Wall (and originally probably all) contain collapsed barrack blocks as well. The quantity of pottery and animal bones from our two trenches in fort 4 excavated in 2006 and 2007, which also yielded some glass and metal, demonstrates powerfully that the fort's interior bustled with life. Radiocarbon dates indicate that the fort remained occupied until at least the first half of the 7th century. It is too early to tell whether

or not the Wall was abandoned then, perhaps because troops were needed for a major assault against the Byzantine Empire, fighting off the Byzantine counter-offensive or against the Arab invasion from AD 636 onwards. The evidence is mounting, however, that the Wall functioned as a military barrier for at least a century and probably closer to two.

A Powerful Military Garrison

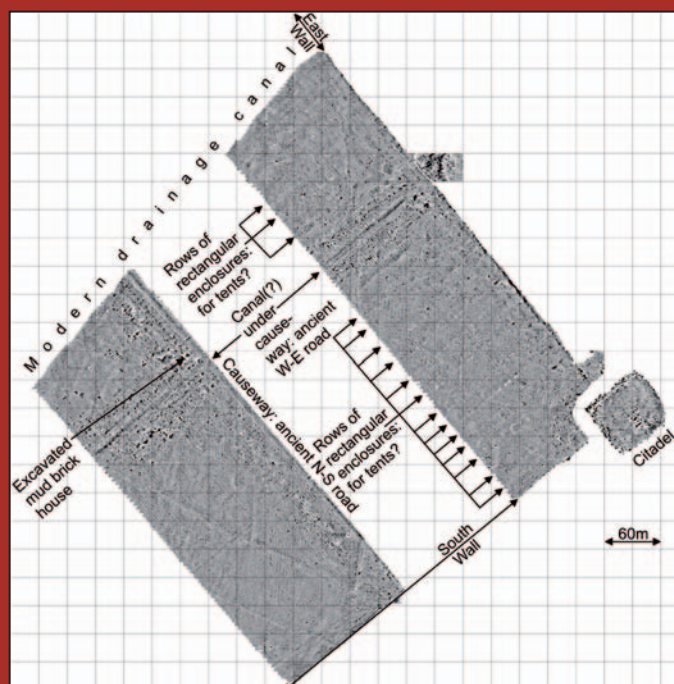
How many soldiers guarded the Persian Empire's most elaborate military barrier? If we assumed that the forts were occupied as densely as those on Hadrian's Wall, then the garrison on the Gorgan Wall would have been in the order of 30,000 men. Models, taking into account the size and room number of the barrack blocks



in the Gorgan Wall forts and likely occupation density, produce figures between 15,000 and 36,000 soldiers. Even the lowest estimate suggests a strong and powerful army, all the more remarkable as our investigations focused just on 200km of vulnerable frontier, a small fraction of the thousands of kilometres of borders of one of the ancient world's largest empires.

How many soldiers may have been stationed in the hinterland? In 2007 we launched a major geophysical survey, followed by three trial trenches in Qaleh Kharabeh, a square fortification covering half a square kilometre, a little over a mile south of the Wall. Analysis of the pottery from Qaleh Kharabeh by Seth Priestman suggests that the fortification was occupied for a short period, perhaps in the earliest phase of the Wall's history. Small mud brick houses seem to line its central roads. We excavated one; analysis of material therein indicates that its occupants consumed a rich diet, including fish, presumably from the Caspian Sea, some 45km further west. Yet, we do not even know whether these erstwhile gourmands were soldiers or civilians. The regular square layout of the defences and the neat rows of rectangular enclosures inside suggests in any case that the Wall-builders had created it. Was it a failed urban foundation? Was it a temporary camp for the Persian field army, reinforcing the Wall's garrison during war? Or was its sudden abandonment linked to the army moving from the hinterland to the Wall forts?

Geophysical survey at fort 16 suggests that there are brick kilns underneath and that this fort was not part of the original design. Is it possible that some or all of the forts were only added



Above Magnetometer survey in Qaleh Kharabeh. Because of the enormous dimensions of this c.650 x 650m fortress (or town?), only two stripes, totalling about a third of the interior, could be surveyed. Note the neat rows of small rectangles in the east. Excavation suggests that they may have been ditched enclosures, perhaps around tents (by Abingdon Archaeological Geophysics and the ICHTO, notably Roger Ainslie, Chris Oatley, Majid Mahmoudi and Mohammad Ershadi).

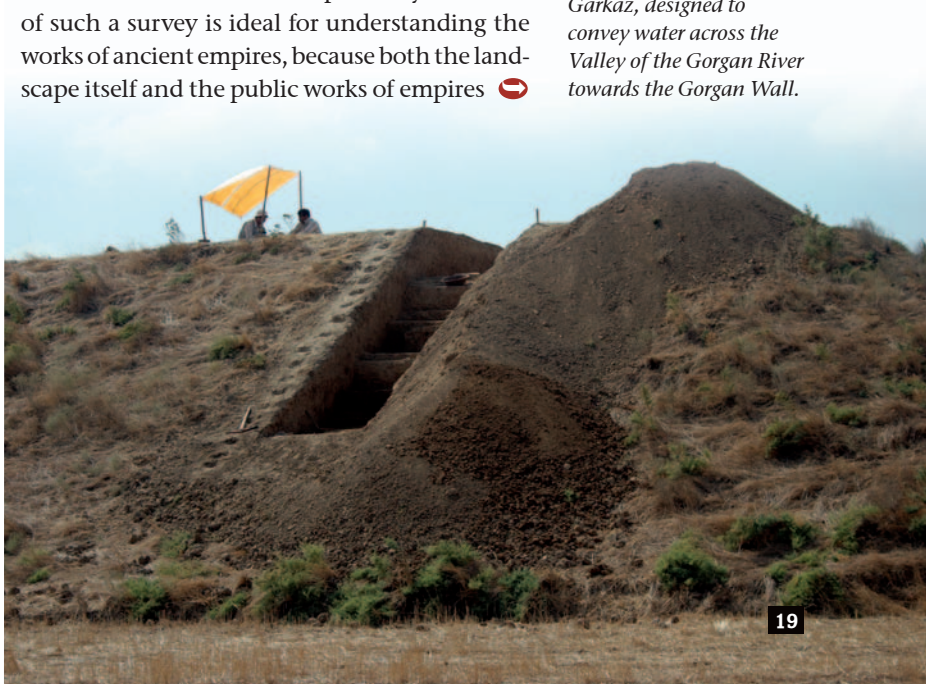
to the Wall at a later stage – and that troops had originally stayed at sites like Qaleh Kharabeh?

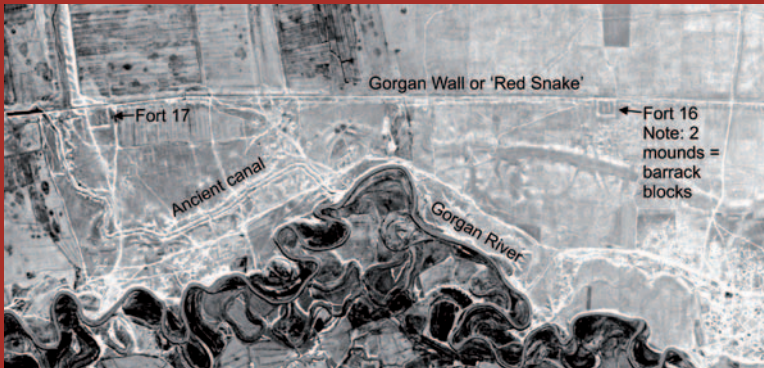
The Wall and its Landscape

The Wall did not exist in a vacuum. The dense occupation of its fertile hinterland explains why it was built and how its garrison was fed. The project was thus not confined to the Wall itself, but included a wider landscape survey. The scale of such a survey is ideal for understanding the works of ancient empires, because both the landscape itself and the public works of empires

Below The citadel of Qaleh Kharabeh with our trench through its mud brick wall in the right (NW) corner.

Below left The earthen barrage of the Sadd-i Garkaz, designed to convey water across the Valley of the Gorgan River towards the Gorgan Wall.





Top Corona satellite image of the massive square enclosure of Qaleh Kharabeh south of the Gorgan Wall.

Above Corona satellite photograph taken in c.1969 showing the snaking course of a canal which led water from the Gorgan River to the ditch north of the Gorgan Wall at Fort 17.

Below In this section the Wall of Tammishe (note the tractor on top of it) survives to a height of c.3m.



cover vast areas. Because of the large areas that needed to be covered, fieldwork of the Gorgan project proceeded at three different scales. At the regional level we used satellite images to map the entire area of Wall and ancillary structures; individual structures (forts, sites and kilns) were then mapped using geophysical survey to recognize hidden and underground structures; finally details were carefully targeted for excavation.

Within this programme the landscape itself was studied using the capability of satellite images to map the entire region of the Wall and beyond. Clearly the c.195km long 'Red Snake' required a huge amount of labour for its construction. But what was not generally known - until Nokandeh, Omrani and colleagues discovered a large dam and associated canals - was that the process of wall construction was even more labour intensive. This is because a huge landscape engineering project was initiated at the time of wall construction to capture and divert water into the ditch that ran along the north side of the Wall.

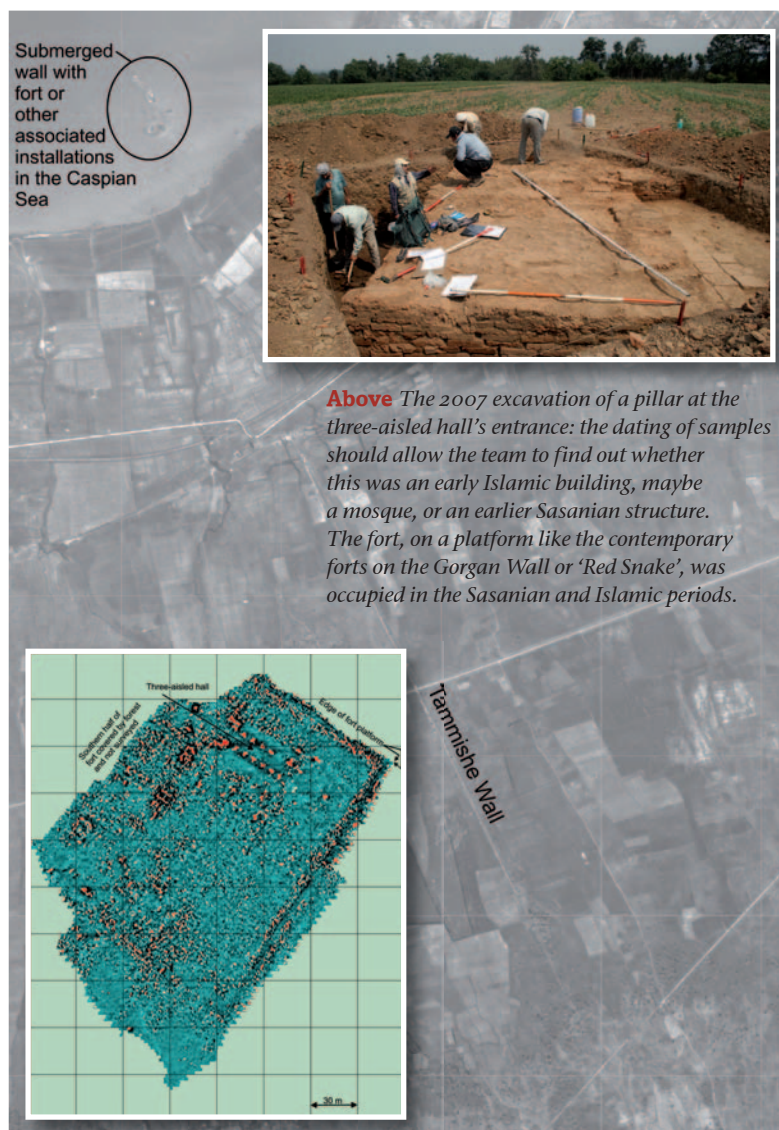
This exercise in water management appears to have been part of an integrated approach to wall construction. In such a semi-arid area, the water required for manufacturing bricks (as well as for use by the inhabitants of the forts) was not readily available. Water was therefore brought to the building site via a series of at least five canals that then directed the water into the ditch on the north side of the Wall. Although this ditch was evidently a defensive feature, it must also have been used as the source of the soil for the bricks used in the Wall. Initially field evidence had implied that the water was impounded behind

massive earthen dams like the so-called Sadd-i Garkaz. However, fieldwork conducted in 2007 has demonstrated that the water was instead gathered from much further afield by a major canal that collected water from a river located to the south-east of the Gorgan River. Water was then led across the top of the 'dam' (which was actually a huge earthen aqueduct) into a canal which led water northward towards the main ditch along the Wall. In addition, this canal supplied a second canal located to the south of the Wall and parallel to it, perhaps to supply the ubiquitous brick kilns. Although the precise mode of water capture of the other canals is less clear, these appear to have received their water directly from the Gorgan River, presumably via a water diversion off-take as is customary with major canals in alluvial plains.

Not only did the Sasanian kings create a new landscape by the construction of water supply canals, they also cut through the pre-existing Parthian and earlier Sasanian landscape like a knife. This resulted in the Wall severing pre-existing landscape features such as a canal that had probably provided the essential supply of irrigation water to the massive site of Tokhmaq a few generations earlier. The Gorgan Wall appears to have cut through at least one other major earlier canal system again cutting off its recipient settlements. There is, however, nothing to say that a massive and wholesale abandonment of land took place at the time of wall construction. Rather, our site surveys as well as studies of the associated pottery by Seth Priestman, suggest that a considerable area of arid steppe to the north of the Wall, which had been occupied intensively several centuries earlier, was abandoned long before the Wall's construction, with the result that it was a redundant landscape that was severed by the 'Red Snake'. This is a model that requires testing by future work.

Wall Search under the Sea

The 'Red Snake' is by far the longest and most elaborate Persian defensive wall, but it has several smaller counterparts. The land corridor between the Caucasus Mountains and the west coast of the Caspian Sea is closed off by a series of walls. The most famous is the Wall of Derbent in modern Dagestan (Russia). Then, much closer to the 'Red Snake' is the contemporary Wall of Tammishe, which runs from the south-east corner of the Caspian Sea into the Elburz Mountains.



Above The 2007 excavation of a pillar at the three-aisled hall's entrance: the dating of samples should allow the team to find out whether this was an early Islamic building, maybe a mosque, or an earlier Sasanian structure. The fort, on a platform like the contemporary forts on the Gorgan Wall or 'Red Snake', was occupied in the Sasanian and Islamic periods.

The Caspian Sea is the world's largest inland sea and depends on inflowing rivers for its water. Its water level has thus fluctuated much more over the centuries than that of the oceans. In 2006 we excavated a test pit into a Sasanian brick kiln, next to the 'Red Snake'. Though it is now 7km inland, it is overlain by marine shells. Radio-carbon dating revealed that the kiln had in fact been submerged under the waters of the rising Caspian Sea in the 14th or 15th century. Whereas when the Wall was built, about one millennium earlier, the Caspian Sea's water level had been a few metres lower than it is today. Today, the Derbent Wall runs into territory currently flooded by the Caspian Sea and, according to a report by the 19th century British traveller Charles Edward Yate, so too is the 'Red Snake'. The only wall, ↻

Above, main image Satellite image of the Wall of Tammishe and the possible remains of a fort or other submerged installation in the Caspian Sea.

Above, inset The Bansaran fort near the Tammishe Wall, site of a legendary palace, in ruins already in the 13th century. Magnetometer survey revealed a 53x33m large three-aisled hall in this fort: a part of this palace? (Image by Abingdon Archaeological Geophysics and the ICHTO, notably Roger Ainslie, Chris Oatley, Majid Mahmoudi and Mohammad Ershadi.)

Iran

however, so far explored by underwater archaeologists is the Tammishe Wall. Discovered by an Iranian team, involving the underwater archaeologist Hossein Tofighian, a joint Iranian and British team followed in their footsteps and dived into the murky water of the Gulf of Gorgan in 2007. Despite the shallow depth of around two metres, visibility in the uniformly greenish to yellowish cloudy water does not reach as far as one foot. The divers, notably Julian Jansen Van Rensburg, relied solely on their sense of touch. Yet, the knowledge of local boatmen, a satellite image and a depth survey allowed us to precision-target promising features. In some areas the sea-bed was so densely strewn with fragments of Sasanian bricks that one hardly ever touched the seabed without feeling the rough surface of yet another broken piece. Our map of high brick concentrations, not all in one line, suggests that there must be more than just the Wall running into the Sea. Future work may tell what other monuments the Caspian Sea conceals: perhaps a Sasanian fort, perhaps a harbour?

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An Ancient Super Power

Our project is seriously challenging our traditional Euro-centric world view. At the time when the Western Roman Empire is collapsing and even the Eastern Roman or Byzantine Empire under great external pressure, the Sasanian Persian Empire musters the manpower to build and garrison a monument of greater scale than anything comparable in the west. The Persians seem to match, or more than match, their Late Roman rivals in army strength, organisational skills, engineering and water management.

Archaeology is beginning to paint a clearer picture of an ancient super power at its apogee. 🇮🇷

Acknowledgements

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Below, from left A handheld GPS unit is used to locate and record targets for the underwater survey.

Middle Bricks recovered from the bottom of the sea are weighed by Hamid Omrani. (Photo: Mohammad Shahi Pudineh)

Right Julian Jansen Van Rensburg recovers a brick fragment. (Photo: Mohammad Shahi Pudineh)

