Scientific Approaches to the Study of Roman Ports

Professor Simon Keay *explains the latest work being done to study the ports of the Roman Empire – in particular the massive site of Portus, the port of ancient Rome itself.*

ONE OF THE defining features of the Roman Empire was that it was primarily an institution based on the Mediterranean. Its success was defined, in part at least, by the centrality of the sea to the movement of armies, ideas and trade, between Rome and its subject communities. Ports and their changing relationships to one another played key roles in these pan-Mediterranean exchanges. In the Roman Ports Project, archaeologists based at the British School at Rome (BSR) – in collaboration with colleagues at a range of UK and European universities and research institutions, and with the support of the British Academy and the Society for Libyan Studies – are using innovative scientific approaches to further our understanding of Roman ports across the Mediterranean. It is a project that is key to the BSR's strategic objective to extend its reach from its traditional focus of research in Italy to the western Mediterranean at large.

The Portus Project

The Roman Ports Project consists of two interrelated initiatives. The first of these is the Portus Project, which is funded by the Arts and Humanities Research Council, and undertaken in conjunction with the Universities of Southampton and Cambridge. It aims to enhance our understanding of the development of Portus, the maritime port of Imperial Rome.

Portus was one of the largest pre-industrial ports of the Mediterranean. It covered some 3.5 km^2 and consisted of two large harbour basins (200 hectares and 32 hectares), which were connected to each other, the Tiber and the Tyrrhenian Sea by a network of canals. There was also a large dock, and a myriad of quays, warehouses, temples and administrative buildings. In conjunction with the neighbouring river port of Ostia, Portus supplied Imperial Rome with key foodstuffs from across the Mediterranean, such as grain, olive oil and wine. It was also the main conduit for the decorative stone that adorned buildings and monuments in the City, together with other luxuries, as well as many of the traders, travellers and slaves known to have moved between Rome and the Mediterranean at large.

Inevitably the great size of the port presents the archaeologist with the challenge of developing a methodology that will enable meaningful answers to research questions to be provided within a reasonable period of time – in this case five years. The main focus of the Portus Project has been directed towards the *Palazzo Imperiale*, or 'Imperial Palace'. This is a three-storey complex covering 3 hectares, which lies at the centre of Portus and holds the key to understanding the development of the port between the mid-1st and mid-6th centuries AD (Figure 1).

Figure 1. *Aerial photograph of the 2009 excavations of Portus. Photo: Portus Project.*

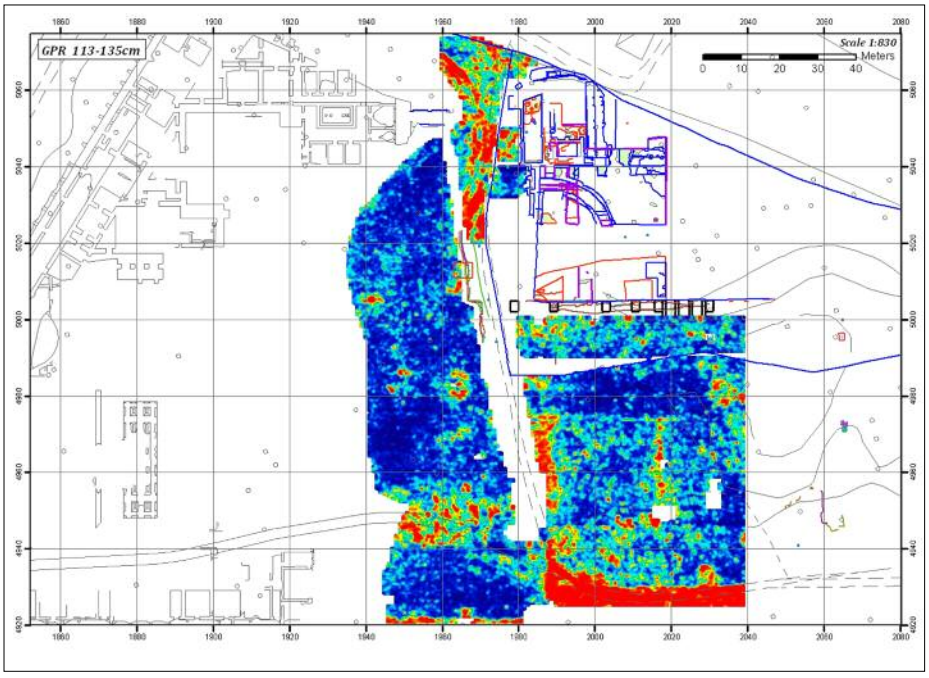

Figure 2. *Image showing the results of Ground Penetrating Radar work at Portus. Source: Portus Project.*

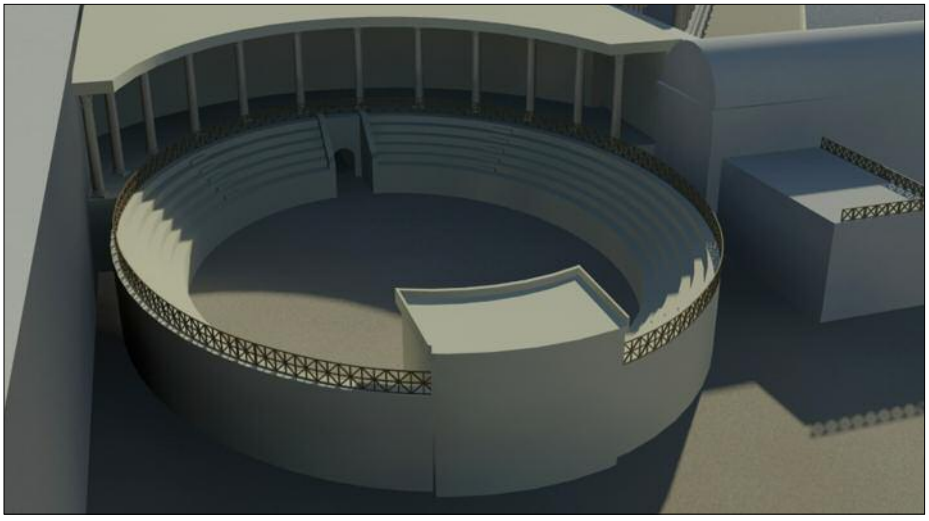

Figure 3. *Computer-based visualisation of the amphitheatre discovered at Portus. Source: Portus Project.*

New techniques

The approach adopted is one that draws heavily upon a suite of scientific approaches that are not often used in concert upon large Classical archaeological sites of this kind. These include topographical and geophysical survey, focused open-area excavation and environmental coring, with the results being integrated and visualised through computer graphic reconstructions. The topography of the complex was recorded by means of combined Total Station, GPS (Global Positioning Systems) and most recently laser scanning survey, which enabled the layout and morphology of standing remains to be plotted together with an indication of those that lay close to the surface. These results formed the backdrop against which to understand more fully the layout of structures lying at differing depths below the surface. Those lying in the first metre or so immediately below the topsoil were mapped by means of magnetometry, a technique that detects alignments of buildings and other buried materials on the basis of variable magnetic signatures. Other techniques were used to detect buildings to a greater depth, down to 3 metres and more. These included Resistance Tomography, which measures changes in electrical resistance in deep 'slices' through the ground, and Ground Penetrating Radar, which uses the speed and form of the response of electromagnetic waves transmitted from the surface from buried structures and voids as an indication of their depth and layout (Figure 2). These techniques were used in concert across the site, employing innovative methods for combining multiple datasets. They proved indispensable in deciding where to excavate, and in helping to interpret features that would have been simply too massive to interpret from excavation alone.

Equally important was the involvement of computer graphics to visualise buried buildings revealed by geophysics, to integrate these with structures revealed by excavation, and to reconstruct both sets of data as a range of postulated standing buildings. Here the objective was not to produce a definitive model of how a particular structure might have appeared in antiquity, but rather to test hypotheses through digital visuals. These short-lived models were part of an interpretative dialogue amongst archaeologists working at the site, whose conclusions were fed back into the excavation process.

In this way we have been able to define and explore an amphitheatre (Figure 3) and one side of an adjacent colonnaded garden in the eastern part of the 'Imperial Palace', and we have gone some way towards understanding the layout and function of a massive (250 m × 80 m) building adjacent to east of it. Furthermore, in conjunction with the Université de Lyon, we have drilled cores in excess of 8 metres in depth in association with excavated quays from the time of Claudius and Trajan: this has enabled us to understand the local marine and coastal environment for the first time.

Imperial works

The use of these techniques in an integrated manner has enabled us to make major contributions to our understanding of the port as a whole. For example it gives us a much clearer idea about the lagoonal nature of the Claudian basin, and how this was

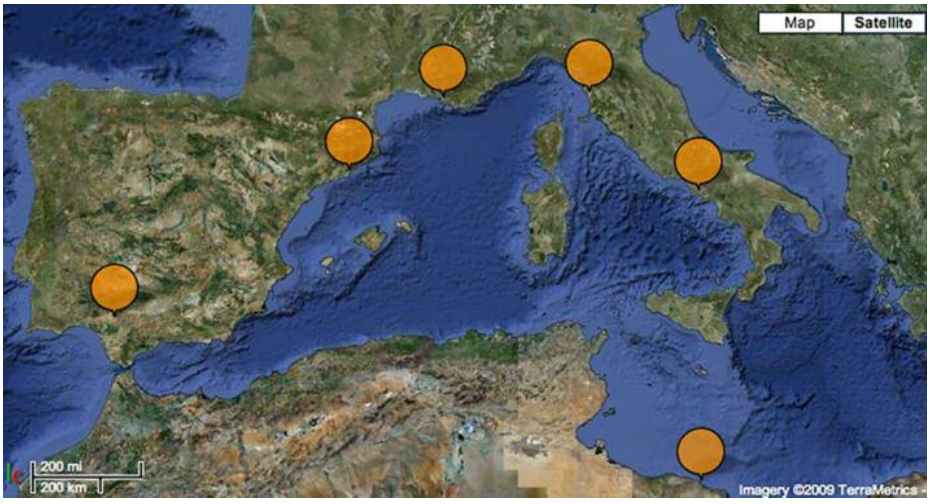

Figure 4. *Sites covered by the Roman Port Networks Project.*

completely transformed by the engineering works undertaken by Trajan in the early 2nd century AD. The discovery in 2009 that the original alignment of the Claudian mole ran beneath the Trajanic 'Imperial Palace' makes it clear that this complex was built upon reclaimed land – probably created by the huge quantities of sand generated during the excavation of his great 32-hectare water-filled hexagonal harbour basin. This seems symptomatic of how Trajan's architects created the dry land necessary for the urbanisation of the early Claudian port. Indeed it lends substance to Pliny the Younger's panegyric (29.2) to Trajan, in which he remarks that in building the new harbour the emperor Trajan had 'let the sea into the shore and moved the shore out to sea.' The same colossal scale of engineering works has also been witnessed by the results of a geophysical survey of the *Isola Sacra*, an island which lies between Portus and Ostia to the south, defined by the Tiber and the Claudian Canal. It has revealed the existence of a massive new canal some 90 metres wide that ran from Portus in the direction of Ostia, in the middle of which there was a small island and which was traversed by a large bridge.

These results illustrate the degree to which emperors were prepared to invest in the key infrastructure necessary to ensure that Rome had a stable and rapid supply of food from its Mediterranean provinces. Geophysical work by the BSR in conjunction with the University of Southampton, at a number of other key Mediterranean port sites is attempting to gather comparative information in an attempt to better understand the nature of their hinterlands. Recent work at Tarraco, Leptis Magna (in conjunction with the Society for Libyan Studies), Ardea and Italica, has started to make significant contributions here too, and new research at Utica in Tunisia is anticipated soon in collaboration with the University of Oxford.

Roman Port Networks Project

The second element of the Roman Ports Project, the Roman Port Networks Project has focused specifically upon relationships between Portus and ports across the Mediterranean (Figure 4). This initiative analyses the co-presence of amphorae and marble as a means of exploring changing connections between Portus, Rome and selected ports in the Mediterranean throughout the imperial period. It involves colleagues working on material from such ports as Marseille, Forum Iulii, Arelate, Barcino, Tarraco, Gades, Hispalis, Leptis Magna, Naples, Pisa and Seville in the west, as well as a selection of ports in the east.

Here too an important methodological initiative lies at its heart. The development of a range of innovative computational techniques (loosely termed the 'semantic web') allows ready communication between diverse datasets, as well as a Geographic Information System (GIS) of the Mediterranean, in order to explore the spatial relationship between networks of ports, and the changing distribution of amphorae. In particular it attempts to establish how far there may have been networks of ports dependent in some way upon Portus, and the degree to which these may have changed through time. As with the Portus Project, the computational components flow from and into the wider archaeological work and we believe lead to innovative archaeological analyses, with a potential for significant new interpretations.

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The success of both of these projects is due in no small measure due to the long-standing international reputation of the BSR as a leading centre of international research, and the results of the kind outlined above will enable it to further enhance and develop its reputation as the place where innovative research in the humanities can prosper.

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More information can be found at www.portusproject.org and at www.romanportnetworks.org

The British Academy is the sponsor and principal funder of the British School at Rome. A full list of the organisations sponsored by the Academy can be found at www.britac.ac.uk/institutes/orgs.cfm