

Large-scale construction in the hinterland of Constantinople Riley Snyder | British Institute at Ankara

In AD 324, after defeating his eastern rival, Constantine set about creating a new metropolis on the Bosphorus, but much work had to be done in order for it to be worthy of the name 'New Rome'. The fourth, fifth and sixth centuries saw many large construction projects within the city, intended to lift the status and glory of Constantinople. With a growing population and increasing threats from its neighbours, the new city required new infrastructures far beyond the confines of the modern megacity of Istanbul.

To meet the needs of the growing city, two of the largest construction projects of late antiquity were primarily built well beyond the city walls. The first was the water supply lines of the fourth and fifth centuries, which extended far into Thrace, almost 120km from Constantinople to modern Vize. This system of channels, tunnels and aqueduct bridges brought much-needed water to the many baths and cisterns of the city (Crow et al. 2008). The second was the sixth century Long Wall of Thrace, also known as the Anastasian Wall, built from the Sea of Marmara to the Black Sea. At a distance of around 65km from the city (Crow, Ricci 1997: 235), this fortified system of towers, forts and curtain walls restricted access to Constantinople and small settlements beyond the protection of the Theodosian Land Walls.

Following the research undertaken by the Anastasian Wall Project, led by James Crow of the University of Edinburgh, my PhD project aimed to build on this research by investigating material technology and structural requirements for the construction of these large systems. The fundamental questions throughout this project revolved around the scale and logistics of the construction of the water-supply system of Constantinople and the Anastasian Wall. These were two of the largest building projects in late antiquity (Crow et al. 2008) with the water-supply lines totalling 502km and the long wall measuring 58km. While these lengths are substantial, understanding the material requirements could provide new insight into their true scale.

The first step of this project was to collect and test samples of mortars from the water-supply system and the Anastasian Wall. Thin-section petrography, scanning electron microscopy (SEM), electron backscatter diffraction (EBSD) and X-ray diffraction (XRD) were used to investigate the finer details of one of the most abundantly used building materials of these structures. The second step extended this research through quantitative means, directly addressing the scale of the water-supply system and the Long Wall. A large inventory of measurements collected from these systems was used to calculate their structural volumes. These volumes were broken down into individual building materials such as facing stones, rubble stone and mortar components. Obtaining these estimates would prove useful in understanding the logistics of the construction processes.

Results of the mortar analysis revealed three primary materials: lime, crushed brick and sand. Additionally, the mortar samples indicated that variations in the mortar recipes were limited to sand-grain size and the proportions of the ingredients. XRD analyses of samples of crushed brick used in the mortars suggest that they all came from similar – if not the same – clay sources, despite the differences between them observed by the naked eye. These results show careful selection of local and imported materials that would otherwise be unobservable.

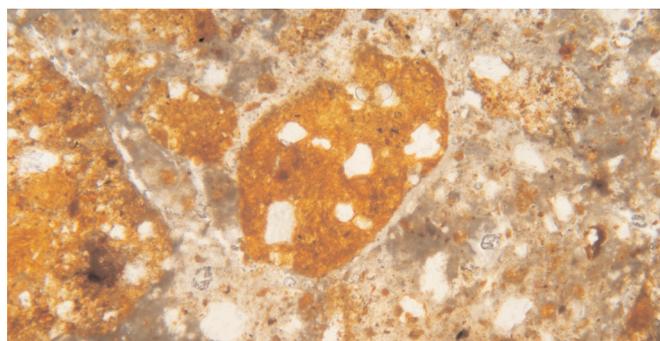
The volumetric calculations and analysis of the petrographic statistical data yielded some important figures about the scales of these systems. The stone necessary for the long-distance water-supply lines totalled 2.5 million cubic metres. To put this in perspective, the area of a standard football pitch would have to be quarried to a depth of 350m – 30m deeper than the height of the Eiffel Tower – producing enough stone to build the Great Pyramid of Giza (Levy 2005). The amount of mortar would fill three and a half of the largest super oil-tankers or 457 Olympic swimming pools. Bricks needed for the mortar would almost encircle the globe if laid end-to-end.

The final stage of this project was to examine the man-power required for the construction process. It was concluded that, despite the far greater length of the water-supply line, the Anastasian Wall would have required nearly the same amount of effort. In the hypothetical and extremely unlikely scenario that 10,000 labourers worked 12-hour shifts every day of the year, it would have taken almost seven years to complete the wall.

From the microscopic to the macroscopic, the water-supply system of Constantinople and the Anastasian Wall enable us to take a closer look at the ingenuity and dedication that was focused on New Rome in late antiquity – a discussion that has typically been limited to Rome at the height of the empire.

Bibliography

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Mortar from the Anastasian Wall in thin section