

**Heather Hopkins**

Great Britain

## **Reconstructing the Dyeing Industry of Pompeii: The Importance of Understanding the Dyers' Craft within a Multidisciplinary Approach**

The economic size and significance of a city can be gauged through an understanding of its industrial capabilities. The dyeing apparatus in Pompeii can be unambiguously identified, allowing a unique understanding of an industry within the context of the city it supplied. Previous understanding of the scale of manufacture of Pompeii's textiles industry relied on theoretical assumptions applied to superficial measurements of surviving apparatus, resulting in inconsistent and controversial results. This study was the first to realise that to understand industrial output it was necessary to reconstruct and use the relevant apparatus. A physical and thermal replica of a dyeing apparatus from Pompeii was reconstructed. As the original apparatus were in varying states of preservation this was the first study to test the viability of the design. The apparatus was used to replicate the dyeing of a complete alum pre-mordanted fleece with madder, the most commonly dyed contemporary textile and technique. The cycle time, temperature, fuel requirements and type, and physical limitations of the apparatus were determined. A complete survey of surviving apparatus was undertaken with an understanding of the requirements of the apparatus and workshop as a whole, and the most comprehensive gazetteer to date produced. Each apparatus was assessed ergonomically and one of Moeller's original workshops was discounted. The replica was amended to explore differences in design, in particular the use of a flue to aid ventilation. This allowed the calculation of a daily output of dyed material for each apparatus, workshop, for the city as a whole and of the annual rate of production. The data from the replica and original remains were combined to create a computer model of the apparatus and Finite Element Analysis (FEA) was used to predict the changes in the materials during the working life of the apparatus and their eventual failure. This was the first time FEA had been used to replicate an archaeological artefact of more than one material or an apparatus. It was discovered that the industry was far smaller than first envisaged.

Use of the dye to produce a consistent, fast result had been examined in preliminary laboratory experiments. Dyestuffs were not included in use of the replica as this would have created additional independent variables in the exploration of the physical operation. Subsequent to the original experiment, discussion with international colleagues revealed some subtleties of use that had been overlooked. For example, it was demonstrated that it was possible to obtain three batches sequentially using a single dye liquor during a single dyeing cycle. This method had not been revealed by the original extensive literature review. If this were undertaken in Pompeii it would have significantly increased the industrial output.

The scale of manufacture of the dyeing industry of Pompeii cannot be determined simply through reconstruction and use of an apparatus; a more complete answer requires a wider understanding of dyeing techniques, the subtleties within the dyers' craft and a fuller understanding of the process for which the apparatus were used.

**Contributor:**

Heather Hopkins

School of Engineering, Design and Technology

Universität Bradford