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43rd Computer Applications and Quantitative Methods in Archaeology

Annual Conference

Book of Abstracts

University of Siena

Department of History and Cultural Heritage



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study of emerging complex societies; however the application of Network Analysis for the study of urbanization and state formation processes remain very few.

By comparing Bronze and Early Iron Age settlement terrestrial and fluvial networks in Etruria and Latium vetus this paper will debate the contrasting trajectories toward higher complexity in these two regions. At the same time it will discuss advantages and issues related to the application of Network Analysis to Archaeology.

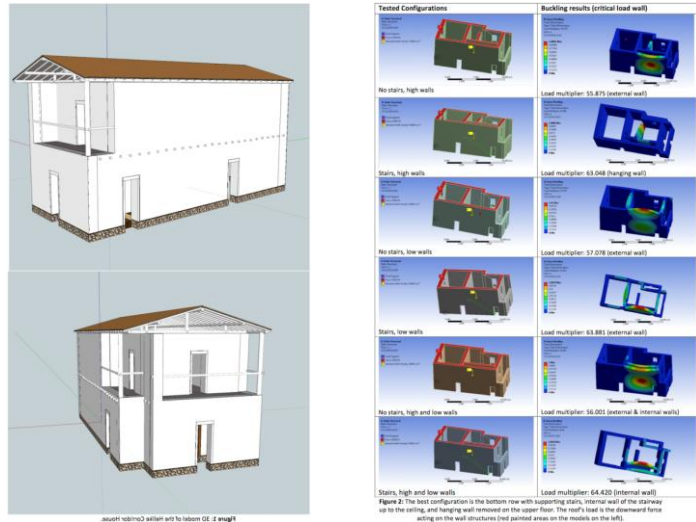
Authors Mariza Christina Kormann, Stella Katsarou, Dora Katsonopoulou, Gary Lock

Title *Structural Integrity Modelling of an Early Bronze Age “Corridor House” in the Peloponnese*

Abstract Structural integrity modelling and simulation studies were performed on the Helike Corridor House (HCH), an EBA monumental building excavated on the coast of the Corinthian Gulf, Southern Greece [1,2,3]. The hypothesis that an upper floor existed was tested to understand the function of innovative structural arrangements introduced during a period of sweeping social transformations during the third Millennium BC. The HCH is part of a proto-urban settlement with complex structures of houses facing paved streets. This work sheds light, from a structural integrity point of view, on the long-debated reconstructions of the so-called ‘Corridor’ EBA architecture by examining the modifications of old ground floor plans into two-storey buildings supporting a tiled roof, with specialized arrangements for high storage capacities [4], cooking facilities, and large living spaces with stairway access. These new structural arrangements with long and narrow corridors raise questions at the functional and structural levels addressed here by advanced computer simulations [5]. The methodology includes 3D solid modelling, material mechanical properties definition, mathematical modelling of the mechanical system, simulation and visualization.

ANSYS [6,7] is a sophisticated modelling and simulation platform for testing how structures behave in the real world based on finite element analysis and mechanical properties of materials. The building materials (unfired mudbrick, clay, pinus halepensis, twigs) and properties (density, modulus of elasticity, Poisson ratio, tensile and stress strength) were carefully defined [8,9,10]. The house geometry was derived from accurate measurements of the excavated foundation walls from the Helike site. The HCH was modelled in SketchUp (Fig 1) for use in ANSYS with the roof being replaced by its equivalent load. Static load analysis followed by buckling (failure) analysis clearly indicates that the long narrow corridors had a structural function. A number of scenarios were simulated including with and without stairs and internal walls on the first floor removed thus making possible provisions for larger rooms. Simulations demonstrate that whichever configuration is adopted buckling would develop in the walls of the narrow corridor area, this being the critical area of the structure due to its configuration of long, tall walls (Fig 2). However, when stairs are introduced the consequence is a more rigid structure less susceptible to buckling in all cases. The conclusion is that the building materials used and the new developed plan with double walls allowed for a second floor. Furthermore, the doubling of the outer walls forming narrow corridors with internal stairs had a clear structural function, a significant result in the context of understanding innovation in EBA architecture.

The results are interpreted through critical discussions in the context of emergent administrative authorities and centralized distribution systems occurring within the realm of the rising Eastern Mediterranean chiefdoms.

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Title

The Stockholm Volterra Project—geophysics, photogrammetry and GIS mapping in exploring the historic centre of Volterra, Italy, from the Etruscan to the medieval period

Abstract

The Archaeological Research Laboratory and the Section of Classical Archaeology and Ancient History at the Stockholm University started in collaboration a field course entitled Field archaeology in land of the Etruscans in 2013. This course, on the undergraduate and master level, introduces the students to different geophysical prospection methods within an urban environment and gives an introduction to the Etruscan culture. The fieldwork takes place over a period of two weeks within the remit of a five-year research permit from the Soprintendenza per i beni archeologici della Toscana and the research is carried out in close collaboration with the city of Volterra, Italy. The methods taught and the studies executed have both educational and scientific aims, and the methods vary from year to year depending on the availability of specialists and results achieved during previous field campaigns. During 2014 the programme included surveys using Ground-penetrating Radar (GPR), RTK-GPS measurements, photogrammetric recording and data collection for a City GIS over Volterra. The 2013 surveys also included magnetometer prospection, continuous vertical electrical sounding (CVES), multi-antenna GPR surveys and terrestrial laser scanning of ancient monuments and buildings within the city. Different parts of the programme balance to a different degree the educational and scientific aims. The clearest geophysical results have been collected using GPR, which, to date, has been used at thirteen different locations in Volterra. The method has revealed new details of the Etruscan and Medieval monuments and provided new information regarding the city plan. All data will eventually be combined in a City GIS that makes use of the digital data provided by the Regione Toscana in the local Gauss-Boaga coordinate system. All data is measured in or transformed into this system. This presentation will focus on presenting new information about the Etruscan city walls of Volterra and the cemetery at the church of Santo Stefano.