



NARNIA

NEW ARCHAEOLOGICAL RESEARCH NETWORK FOR
INTEGRATING APPROACHES TO ANCIENT MATERIAL STUDIES



University of Cyprus

Archaeological Research Unit

THE NARNIA PROJECT

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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement No. 265010.



Edited by
Vasiliki Kassianidou &
Maria Dikomitou-Eliadou



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LIST OF ABBREVIATIONS

BA	Bronze Age
BE or BSE	Back-scattered Electron mode
BG	Black Glazed Attic pottery
CLODD	Clustering in Ordered Dissimilarity Data
DTA	Differential Thermal Analysis
DTA-TG	Differential Thermal Analysis - Thermogravimetry
DM	Digital Microscopy
EBA	Early Bronze Age
EDS or EDX	Energy Dispersive X-ray Spectrometry
ED-XRF	Energy Dispersive X-ray Fluorescence spectrometry
EM	Early Minoan period
ESD	Equivalent Spherical Diameter
ESR	Electron Spin Resonance
FCM	Fuzzy C-Means clustering algorithm
FN	Final Neolithic period
FORS	Fiber Optic Reflectance Spectrometry
FTIR	Fourier Transform Infrared spectroscopy
GC-MS	Gas Chromatography–Mass Spectrometry
HIT	High Iron Titanium glass
HIMT	High Iron Manganese Titanium glass
HPLC	High-Performance Liquid Chromatography
IC	Ion Chromatography
ICP	Inductively Coupled Plasma spectrometry
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
IR	Infrared signal
IRSL	Infrared Stimulation of feldspar
Km	Kilometres
LA-ICP-MS	Laser Ablation Ion Coupled Plasma Mass Spectrometry
LBA	Late Bronze Age
LC	Late Cypriot Bronze Age
LH	Late Helladic Bronze Age

ABBREVIATIONS

LI	Lead Isotope analysis
MBA	Middle Bronze Age
MC-ICP-MS	Multi-Collector-Inductively Coupled Plasma -Mass Spectrometry
MIP	Mercury Intrusion Porosimetry
μ -PIXE	Micro Proton-Induced X-ray Emission
μ -XRF	Micro X-Ray Fluorescence spectrometry
NAA	Neutron Activation Analysis
ORO	Firing cycle that includes successive firing stages under Oxidising, Reducing, and Oxidising kiln atmosphere conditions
OSL	Optically Stimulated Luminescence
PCA	Principal Component Analysis
PIGE	Particle Induced γ -ray Emission spectrometry
pIRIR	post-Infrared Infrared-Stimulated luminescence
PIXE	Particle Induced X-ray Emission spectrometry
PLM	Polarised Light Microscopy
pXRF	Portable X-Ray Fluorescence spectroscopy
PWWM	Plain White Wheel-made ware
Redox	Portmanteau of words reduction and oxidation
SAR	Single-Aliquot Regenerative dose
SE	Secondary Electron mode
SEM	Scanning Electron Microscopy
TG	Thermogravimetry
TL	Thermoluminescence
TRS	Transverse Rupture Strength
UV-vis	Ultraviolet Visible spectrophotometry
UV-vis-NIR	Ultra Violet-visible-Near Infra Red
VAT	Visual Assessment Tendency
w%	Weight percentage (mass concentration)
XRD	X-ray Diffraction

THE NARNIA PROJECT: INTEGRATING APPROACHES TO ANCIENT MATERIAL STUDIES

This book introduces the research work conducted in the four-year lifespan of the European Marie Curie Actions Initial Training Network (FP7 – PEOPLE – Marie Curie Actions – ITN – Project no. 265010) *New Archaeological Research Network for Integrating Approaches to ancient material studies*, with the acronym NARNIA. This is currently the largest project to receive funding from the European Commission in the fields of archaeology and archaeological sciences, with a budget over 4.5 million Euros and 20 recruited research fellows.

NARNIA was envisaged and realised on the basis that the most comprehensive archaeological studies are those which combine traditional methods of typological and stylistic classification with analytical techniques deriving from the natural and digital sciences, and that the relationship between fieldwork and laboratory is a critical factor for the successful completion of any project. The ultimate objective of NARNIA, therefore, was the development of a new generation of scholars, who understand the complexities of interdisciplinary projects, and may integrate in their research differing techniques and methodological approaches for a holistic study of ancient material culture, enhancing our knowledge on different aspects of the history and archaeology of the eastern Mediterranean.

NARNIA provided a unique opportunity and a rigorous research platform for the collaboration of nine partners; six academic institutions, one research centre and two private enterprises. These are the University of Cyprus – which was the coordinating institution –, Vrije Universiteit Brussel, Université Paris-Ouest, the Hashemite University, University College London, the University of Sheffield, the National Centre for Scientific Research “Demokritos”, G. M EuroCy Innovations Ltd and Thetis Authentics Ltd. The NARNIA partnership was active in six different countries, i.e. Cyprus, Belgium, France, Greece, Jordan, and the United Kingdom.

The success of the NARNIA project was already betokened by the success of the initial application to secure the funding. It can be argued - paraphrasing the Roman philosopher Seneca – that success is what happens when preparation meets opportunity. The application that the NARNIA partnership submitted for funding had to compete with 862

other proposals, from all fields of research, and secured both the highest rating and the largest budget among the 63 applications that were finally selected for funding. This was a promising beginning for a project that became an amazing success story and a great school for all those actively involved for its implementation.

During its four-year lifespan, NARNIA brought together the *crème de la crème* of the archaeological research community – already friends and colleagues – from various research institutions with the shared ambition to join forces, each one offering their expertise, for the realisation of a training and research agenda that could never have been achieved by a sole academic institution. The NARNIA partnership recruited 16 Early Stage Researchers and four Experienced Researchers that became the core focus of the project and its driving force. The duration of the 16 Early Stage Researcher fellowships was three years; during that time they all embarked on doctoral research, following training courses that would enable them to complete a doctoral thesis. The four Experienced Researchers were recruited for two years, in order to complement the training and research activities of the project and conduct research on a post-doctoral level. It is our belief that among the hundreds of applications that the NARNIA partnership received prior to recruitment, we have succeeded in selecting a multinational group of brilliant young scholars that will continue to contribute to archaeological research, putting into practice everything that they have learnt during their involvement in the NARNIA project.

As NARNIA is a Marie Curie ITN, a significant component of the project was dedicated to the training of the fellows. The *raison d'être* of the network was to improve the career prospects for employment of our 20 fellows by enabling them to develop lab-based skills needed for the study of ancient materials. In order to achieve this aim, the partner institutions organised an impressive series of research and training activities. During its four-year lifespan, NARNIA offered 26 training courses across the six participating countries, on the interdisciplinary study of ancient pottery, glass, metals, architectural decoration and building materials, as well as dating and the palaeo-environment, and the application of portable X-ray fluorescence spectroscopy in the field of archaeology. All NARNIA training courses were open to researchers outside the network, and the 16 Early Stage Researchers and four Experienced Researchers recruited by the NARNIA partnership had the opportunity to communicate and interact with scholars and researchers from different disciplines and research backgrounds.

The training agenda of NARNIA was structured to include both scientific training, and training for the development of complementary skills. This assorted corpus of training

courses was designed specifically for the diverse research community of NARNIA, which was composed by archaeologists, conservators, physicists, chemists, engineers, and IT analysts. Furthermore, the generous funding that we had received, allowed us to invite high-profile scholars, specialists in the various topics scrutinised by our training courses, in order to train, exchange and discuss ideas and methodologies with our fellows and scientific staff. The NARNIA training courses attracted the interest of the wider research community, and were, thus, also followed by young and more experienced researchers outside the project network.

In addition to the prime scope of NARNIA, which was to offer our fellows the best possible training on archaeological sciences and the analytical techniques applied to the study of ancient materials, improving their prospects of employment and career development, the NARNIA network has been also contributing to the history and archaeology of the eastern Mediterranean basin, a region of great historical, cultural and geopolitical significance. Ancient technology has had a significant effect on the development of humans and their societies, as both human and social evolution are directly entwined with the materials, which, on the one hand, were accessible at any given time and place, and on the other, had the appropriate properties to lend themselves for making artefacts and serving functions. Therefore, the assessment of ancient materials and their processing for the production of artefacts and the evaluation of ancient techniques and know-how are essential prerequisites in composing the history of science and technology, as well as understanding cultural change, and both local and regional histories.

The core research area of NARNIA was focused on the interdisciplinary study of ancient ceramics, glass, copper and its alloys, architecture and building decoration, as well as on techniques of dating and chemical analysis of ancient materials. This requires the full integration of analytical methodologies from the mainstream fields of chemistry, geosciences and engineering in order to develop a supra-disciplinary area of science and technology applied in archaeology. It is emphasised that the combination of infrastructures and analytical equipment made available within the partnership provided our fellows the means and support to conduct an interdisciplinary study of the materials that they have been assigned to investigate, and to answer key archaeological and cultural questions.

We were very pleased to observe that despite the division of the project into six distinct work packages, our fellows identified areas of research overlap, and developed important synergies among them, integrating different approaches and areas of research, always with the support and guidance of their supervisors and other members of the partnership. This

has resulted in a number of joined publications, as well as the establishment of research collaborations that will continue to flourish after the completion of the project.

Towards the end date of the NARNIA project, we have prepared this book as a solid reflection of the individual and collective work that has been conducted for the past four years by all our fellows and members of the NARNIA partnership. The short papers presented by our fellows in the following pages, are only a glimpse of their research, which will be more extensively published in peer-reviewed journals and, hopefully, monographs following the submission of their doctoral theses. We envisage this book to serve as a medium for people outside the network to become acquainted with the research that was undertaken by our fellows under the supervision of the NARNIA scientific staff, but also as a token of the hard work, dedication and passion of all the people that worked hard for NARNIA to become a milestone in archaeological research.

Prof. Vasiliki Kassianidou, NARNIA Project Coordinator

&

Dr Maria Dikomitou-Eliadou, NARNIA Project Manager

Archaeological Research Unit, University of Cyprus

Nicosia, November 2014



THE NARNIA NETWORK

Members of supervisory board, Early Stage Researchers (ESR), Experienced Researchers (ER), and other scientific staff per work package

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	Department of Antiquities, Cyprus	
	The Jordan Museum, Jordan	
	NITON UK, UK	