

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/326539627>

Pottery Exchange Networks under the Microscope: The case of Neolithic Thessaly

Chapter · December 2017

DOI: 10.2307/j.ctvw049k3.29

CITATIONS

4

READS

375

1 author:



[Areti Pentedeka](#)

Ministry of Culture and Sports

20 PUBLICATIONS 103 CITATIONS

SEE PROFILE

Communities, Landscapes, and Interaction in Neolithic Greece



Edited by
*Apostolos Sarris, Evita Kalogiropoulou,
Tuna Kalayci and Lia Karimali*



INTERNATIONAL MONOGRAPHS
IN PREHISTORY
Archaeological Series 20

Communities, Landscapes, and Interaction in Neolithic Greece

*Proceedings of the International Conference,
Rethymno 29-30 May, 2015*

Edited by
Apostolos Sarris
Evita Kalogiropoulou
Tuna Kalayci
Lia Karimali



INTERNATIONAL MONOGRAPHS
IN PREHISTORY

Archaeological Series 20

© 2017 by International Monographs in Prehistory
All rights reserved

Printed in the United States of America
All rights reserved

Paperback:
ISBN 978-1-879621-47-3
Hard Cover:
ISBN 978-1-879621-48-0

Library of Congress Cataloging-in-Publication Data

Names: Sarris, Apostolos, editor. | Kalogiropoulou, Evita, 1979- editor. |
Kalayci, Tuna, 1980- editor. | Karimali, Lia, editor.
Title: Communities, landscapes, and interaction in neolithic Greece :
proceedings of the international conference, Rethymno 29-30 May, 2015 /
edited by Apostolos Sarris, Evita Kalogiropoulou, Tuna Kalayci, Lia
Karimali.
Description: Ann Arbor, Michigan : International Monographs in Prehistory,
2017. | Series: Archaeological series ; 20
Identifiers: LCCN 2017045356 | ISBN 9781879621480 (hardcover : alk. paper) |
ISBN 9781879621473 (pbk. : alk. paper)
Subjects: LCSH: Neolithic period--Greece. | Social archaeology--Greece. |
Landscape archaeology--Greece. | Excavations (Archaeology)--Greece. |
Greece--Antiquities.
Classification: LCC GN776.22.G8 C65 2017 | DDC 938--dc23
LC record available at <https://lcn.loc.gov/2017045356>

This book is printed on acid-free paper. ∞

International Monographs in Prehistory
Ann Arbor, Michigan 48106-1266
U.S.A.

Table of Contents

<i>List of Contributors</i>	vii
<i>List of Figures</i>	xiii
<i>List of Tables</i>	xxv
<i>Maps</i>	xxvii

Introduction

1 - Evita Kalogiropoulou and Apostolos Sarris <i>Communities, Landscapes, and Interaction: An Introduction</i>	1
---	---

Part I: Communities, Social Spaces, and Dimensions of Neolithic Lifeways (and Death)

2 - Agathe Reingruber <i>The Transition from the Mesolithic to the Neolithic in a Circum-Aegean Perspective: Concepts and Narratives</i>	8
3 - Apostolos Sarris, Tuna Kalayci, François-Xavier Simon, Jamieson Donato, Carmen Cuenca García, Meropi Manataki, Gianluca Cantoro, Ian Moffat, Evita Kalogiropoulou, Georgia Karampatso, Kayt Armstrong, Nassos Argyriou, Sylviane Dederix, Cristina Manzetti, Nikos Nikas, Konstantinos Vouzaxakis, Vasso Rondiri, Polyxeni Arachoviti, Kalliopi Almatzi, Despina Efstathiou, and Evangelia Stamelou <i>Opening a New Frontier in the Study of Neolithic Settlement Patterns of Eastern Thessaly, Greece</i>	27
4 - Maria Pappa, Stratos Nanoglou, and Melina Efthymiadou <i>A Road to Variation: Diversity among Neolithic Settlements in Central Macedonia, Greece</i> ...	49
5 - Dimitra Malamidou, Maria Ntinou, Soultana-Maria Valamoti, Zoī Tsirtsoni, Haïdo Koukouli-Chrysanthaki, and Pascal Darcque <i>An Investigation of Neolithic Settlement Pattern and Plant Exploitation at Dikili Tash: Reconsidering Old and New Data from the late 5th Millennium B.C. Settlement</i>	60
6 - Yannis Hamilakis, Nina Kyparissi-Apostolika, Thomas Loughlin, Tristan Carter, James Cole, Yorgos Facorellis, Stella Katsarou, Aggeliki Kaznesi, Areti Pentedeka, Vasileios Tsamis, and Nicolas Zorzin <i>Koutroulou Magoula in Pthiotida, Central Greece: a Middle Neolithic Tell site in Context</i>	81
7 - John E. Coleman, Evangelia Karimali, Lilian Karali, Melanie Fillios, Charlotte Diffey, Petra Vaiglova, Amy Bogaard, Jayme Joos, Effie Angeli <i>The Environment and Interactions of Neolithic Halai</i>	97
8 - William Parkinson, Anastasia Papathanasiou, Michael Galaty, Daniel Pullen, Panagiotis Karkanas, Giorgos Papathanassopoulos <i>Diros in Context: Alepotrypa Cave and Ksagounaki Promontory in the Neolithic Period</i>	126

9 - Eva Alram-Stern, Apostolos Sarris, Konstantinos Vouzaxakis, Kalliopi Almatzi, Polyxeni Arachoviti, Vasso Rondiri, Despina Efstathiou, Evangelia Stamelou, Carmen Cuenca García, Tuna Kalayci, François-Xavier Simon, Gianluca Cantoro, Jamieson Donati, Meropi Manataki <i>Visviki Magoula Revisited: Comparing Past Excavations' Data to Recent Geophysical Research</i>	137
10 - Josette Renard and William Cavanagh <i>Kouphovouno (Lakonía): Some Thoughts about the Settlement Pattern at the end of the Middle Neolithic</i>	149
11 - Dimitris Kloukinas <i>Pictures of Home: Regional Perspectives into the Neolithic Building Technology of Northern Greece</i>	167
12 - Tomáš Alušík <i>Communities Interaction and (intended) Land Use in Neolithic Greece: the Testimony of the Defensive Architecture</i>	187
13 - Katerina Psimogiannou <i>Fluid Landscapes, Bonded People? The Role of Burial Areas as Places for Interaction, Exchange and Deposition during the Final Neolithic Period in Central and Southern Greece</i>	199
Part II: Landscape Dynamics and Subsistence Strategies	
14 - Evita Kalogiropoulou <i>Islands out of the Mainstream: Landscapes of Action, Settlements and Social Identities in the Neolithic Aegean</i>	218
15 - Žarko Tankosić and Markos Katsianis <i>Cycladic or Mainland? The Prehistoric Landscapes of Southern Euboea</i>	234
16 - Georgia Stratouli and Odysseas Metaxas <i>Human – Landscape Interaction in Neolithic Kephallonia, West Greece: the Dynamic Role of Drakaina Cave within an Insular Environment</i>	247
17 - Julien Beck, Dimitris Sakellariou, and Despina Koutsoumba <i>Submerged Neolithic Landscapes off Franchthi Cave: the Measurements from the Terra Submersa Expedition and their Implications</i>	261
18 - Georgia Koromila, Panagiotis Karkanis, Georgia Kotzamani, Kerry Harris, Yannis Hamilakis, and Nina Kyparissi-Apostolika <i>Humans, Animals, and the Landscape in Neolithic Koutroulou Magoula, Central Greece: an approach through micromorphology and plant remains in dung</i>	269
19 - William Cavanagh, Josette Renard, Amy Bogaard, Armelle Gardeisen, Jean Cantuel, Petra Vaiglova, and Charlotte Diffey <i>Farming Strategies at Kouphovouno, Lakonia, in the MN-LN periods</i>	281

20 - George Kazantzis	
<i>Animal Husbandry and the Use of Space in the Greek Sector of the Late Neolithic Settlement of Promachon-Topolnica</i>	292

Part III: Interactions and Material Perspectives

21 - Nikos Efstratiou	
<i>Social Interaction in the Farming Communities of Neolithic Greece: Archaeological Perceptions</i>	319
22 - Dushka Urem-Kotsou, Anastasia Dimoula, Gazmed Elezi, Trisevgeni Papadakou, Anna Papaioannou, Niki Saridaki, Ioanna Siamidou, Teresa Silva, Eirini Tzemopoulou, and Kostas Kotsakis	
<i>Patterns in Contemporaneous Ceramic Traditions: Inter-Regional Relations between Thessaly and Macedonia during the Early and Middle Neolithic</i>	324
23 - Areti Pentedeka	
<i>Pottery Exchange Networks under the Microscope: the case of Neolithic Thessaly</i>	339
24 - Vagia Mastrogiannopoulou	
<i>The Discovery of Painted Pottery in Caves: an Interpretation in the Case of Sarakenos Cave (Kopais, Boeotia)</i>	353
25 - Lily Bonga	
<i>Thoughts on the Preliminary Study of Early Neolithic Decorated Pottery from the Central Origma at Mavropigi-Filotsairi</i>	374
26 - David Michael Smith	
<i>Emergent Networks and Socio-Cultural Change in Final Neolithic Southern Greece</i>	388
27 - Eva Alram-Stern	
<i>Ritual and Interaction during the Final Neolithic Period: the example of Aegina-Kolonna</i> ...	399
28 - Tasos Bekiaris, Christos Stergiou, and Stella Theodoridou	
<i>Making Choices in a Neolithic Landscape: Raw Materials and Ground Stone Technology in Neolithic Avgi, Northwest Greece</i>	415
29 - Odysseas Kakavakis	
<i>Chipped Stone Aspects of the Interaction among Neolithic Communities of Northern Greece</i>	434
30 - Lilian Dogiama	
<i>Casting A Wide Network: Preliminary Results from the Early Neolithic Chipped Stone Assemblage from Revenia, Pieria (Greece)</i>	446

Color Plates	465
---------------------------	-----

Pottery Exchange Networks Under the Microscope: The Case of Neolithic Thessaly

Arete Pentedeka

Abstract

Thessaly, situated in the heart of the Greek mainland, comprises a diverse landscape, combining mountain formations, flat plains, river valleys, lacustrine environments, and coastland in harmony. A rich and rather uniform pottery production characterizes the entire region throughout the Neolithic period, forming a robust typology that has heavily influenced our view of the Neolithic of central and northern Greece. A large-scale analytical program, based on ceramic petrography and including published results of older chemical and petrographic analyses, investigated coarse- and fineware potting traditions and connectivity within Thessaly during the Middle and Late Neolithic. The pottery examined derived from a large number of settlements in Thessaly and combined excavation and surface/survey contexts. A number of production centers, most frequently ware-specific, was detected, while the parallel activity of different exchange networks and the variability of the distribution patterns highlighted the complexity of this connectivity and exposed substantial interregional diversification within Thessaly.

Keywords

exchange networks, pottery, Thessaly, Middle Neolithic, Late Neolithic, petrographic analysis

Pottery Exchange Networks under the Microscope: Introducing the Methodology

The study of exchange in Neolithic Greece has received little attention in comparison to, for example, pottery typology or figurine studies. Most of the relevant literature focuses on the circulation and distribution of raw materials used for the production of stone tools, and in particular obsidian (e.g. Karimali 2009, Perlès 1990). In effect, it was the search for the ancient obsidian sources in the spirit of New Archaeology that launched the discussion on exchange

in Neolithic Greece (Renfrew 1972:440–475; Renfrew et al. 1965).

Catherine Perlès (1992), in the (so far) unique review on systems of exchange in Neolithic Greece, examined almost all the artifact categories, including excavation finds that are usually found in large quantities, like pottery and lithics, as well as rare finds (shell or stone ornaments, stone vases, stone seals and ear-studs, metal objects, and marble figurines). This review is not without problems, although it is undisputedly important, as it presents all the different organizations of patterns of exchange as they were recognized in the archaeological record at the time of its publication. With regard to pottery, the main argument was that Neolithic pottery did not circulate, and when it did, it concerned only highly decorated finewares, which acted as rare goods. In her response to Perlès, Vitelli (1993) highlighted some attributes she considered important for and specific to pottery production and distribution, for instance the need to view monochrome wares as equally significant to the decorated ones, to accept that the knowledge of firing is specialized, or to take into account the specific excavation context when characterizing an artifact as being of utilitarian or non-utilitarian use. In a later paper co-authored by Perlès and Vitelli (1999), craft specialization and exchange were approached within a social, rather than a purely economic, framework. The dynamic of social organization was emphasized, especially with regard to pottery production and craft specialization; thus, this comprehensive review revealed the diversity of exchange practices and laid the groundwork for technology-sensitive approaches to exchange (e.g. Perlès 2007, 2012).

Nevertheless, there is a series of issues pertaining to the above that need to be revisited and clarified, since they are fundamental when discussing exchange, especially of pottery. Exchange is archaeologically tangible through the detection of networks resulting from the distribution of artifacts or raw materials deriving from a specific and known source. In the case of pottery, what can be identified are the source and the final destination of the pottery, thus testifying to

its circulation. Exchange, therefore, is inferred from the connectivity revealed by the movement of things and people in the landscape (as outlined by Ingold 2000:187–208, 2011:145–155), exhibiting an inherent spatial dimension. The identification of the source can be achieved only through the use of analytical techniques like petrographic or chemical analysis. The characterization of production as being local to a specific settlement, however, is not restricted to the identification of the local raw material sources. A local potting tradition is formed primarily by the potting technology that is adopted. It has been convincingly argued within material culture studies that technology is a way through which people give society a material dimension, thus rendering society durable; technology manifests the ideas, perceptions, and symbolisms via which society comes into existence and reproduces itself (Latour 1991:51–55, 79, 1993:379–380; Latour and Lemonnier 1994:15–16). Within this society-sensitive perspective, the study of technology benefited greatly from the *chaîne opératoire* concept (Cresswell 1996; Lemonnier 1976; for a thorough review, see Roux 2016). The *chaîne opératoire* comprises a set of actions leading to the finished product; for each stage, the craftsman makes a series of technological choices, rendering technology fluid, since it is exactly through these choices that technology is formed by, as much as it forms, human practice (Lemonnier 1993; Sillar and Tite 2000; van der Leeuw 1993). It is during and through the technological practice that the agents form and transform their individual and collective identities (Dobres 1999, 2000:127–163; Gosselain 1998; Pfaffenberger 1999). Returning to pottery exchange, the formation of a local potting tradition can be studied via the reconstruction of the *chaîne opératoire* of the various pottery wares, and in particular of specific technological choices in all stages of the pottery making. Technological knowledge can be equally distinctive and informative regarding the structure and organization of pottery networks, as well as clay paste recipes and the actual pottery products.

Petrographic analysis is considered to be the most suitable analytical technique applicable to archaeological ceramics for the investigation of both pottery technology and provenance issues. It enables the identification of the mineralogical composition of the pottery and its direct comparison with the sediments deriving from the geological formations in the vicinity of the site under study. In this way, the local pottery production is compositionally characterized, and, in combination with raw material prospection and chemical analysis, ancient exchange/trade can be discussed further. The detailed examination of the

raw materials that were used can shed light not only on the ancient perception of a given environment as a resource and as a familiar terrain; to a certain extent it can also reveal certain natural traits characterizing the surrounding environment at the time (e.g. lakes, marshes, etc.) that are not observable in the present. Moreover, petrographic analysis allows for the observation of various elements of manufacturing technology and surface treatment techniques, thus illuminating the choices ancient potters made within their social, cultural, and natural environments (Whitbread 1995, 2001). Such an approach allows for inferences about technological traditions, the organization of production (e.g. standardization), and the distribution of wares and fabrics, and ultimately some suggestions about the social role of ceramics in the given society. At the same time, however, it brings the movement of humans and things to light, revealing the lived-through landscape (as a tangled mesh of personalized trails; Ingold 2011:47).

Thessaly during the Neolithic: A Case Study for Analysis

Situated in the heart of the Greek mainland, Thessaly comprises a diverse landscape, combining mountain formations, flat plains, river valleys, lacustrine environments, and coastland in harmony. It was a densely populated area during the Neolithic, the majority of settlements forming tells and others being extended, while cave habitation is also attested (Gallis 1992; Halstead 1984; Kyparissi-Apostolika 2000; Milošević 1960; Reinders 2004; Theocharis 1967, 1973; Tsountas 2000 [1908]; Wace and Thompson 1912; YPPOT 2012:158–159). A rich and rather uniform pottery production characterized the entire region throughout the Neolithic period, forming a robust typology that has heavily influenced our view of the Neolithic in central and northern Greece (Demoule et al. 1988; Gallis 1992; Hauptmann 1981; Kotsakis 1983; Milošević 1960; Mottier 1981; Rongiriri 2009; Wace and Thompson 1912).

This stylistic affinity has been examined by two large-scale archaeometric projects to detect whether it is a result of mere stylistic adoption favored by shared beliefs between the Neolithic communities of Thessaly, with pottery production being local in every respect, or whether it is a marker of pottery exchange within the wider region of Thessaly. In the early 1990s, Schneider et al. (1991) analyzed ca. 1,000 pottery samples, mainly surface finds, using chemical analysis with X-ray fluorescence, as well as limited X-ray diffraction, scanning electron microscopy, and petrographic analysis. An important outcome of their

research was the detection, beyond any doubt, of a specific production center for the Late Neolithic Grey ware in northwest Thessaly (in the vicinity of Platia Magoula Zarkou, if not in Platia Magoula Zarkou itself). From there, Grey ware was circulated within the rest of Thessaly and beyond. Additionally, the authors suggested Makrychori 2 as a possible center for the production of some of the Black Burnished pottery that was analyzed (Figure 1).

Almost 30 years after this important study, it became apparent that Neolithic pottery circulation and exchange across Thessaly should be re-examined within a different, more society- and technology-sensitive context. Building upon their analytical work, I developed the theoretical and methodological framework outlined above (for elaboration and further discussion on this holistic approach, see Pentedeka 2008:6–36, 2011) and adopted an integrated method-

ology including petrographic analysis, refiring tests, and raw material prospection and experimentation, as well as the existing corpus of chemical analysis. A total of almost 1,000 samples was examined; the sherds were representative of major undecorated and decorated wares dating to the Middle Neolithic (MN) II–III (coarse, Red Monochrome/A1, Scraped, Red-on-White, White-on-Red wares), Late Neolithic (LN) I (coarse, Red Monochrome, Scraped/Protogrey, Protogrey, Grey/Grey-on-Grey, Black Burnished, Matt-Painted, Black-on-Red, Bichrome, Polychrome wares), and LN II phases (coarse, Black-on-Red, Brown-on-Cream, Incised wares), covering the time span of ca. 5800–4500 B.C. (for detailed discussion and phase synchronization, see Alram-Stern 2015:91–101, Table 1). The selected samples derive from 18 stratified excavation assemblages (Theopetra Cave, Platia Magoula Zarkou, Makrychori 2, Agia Sophia,

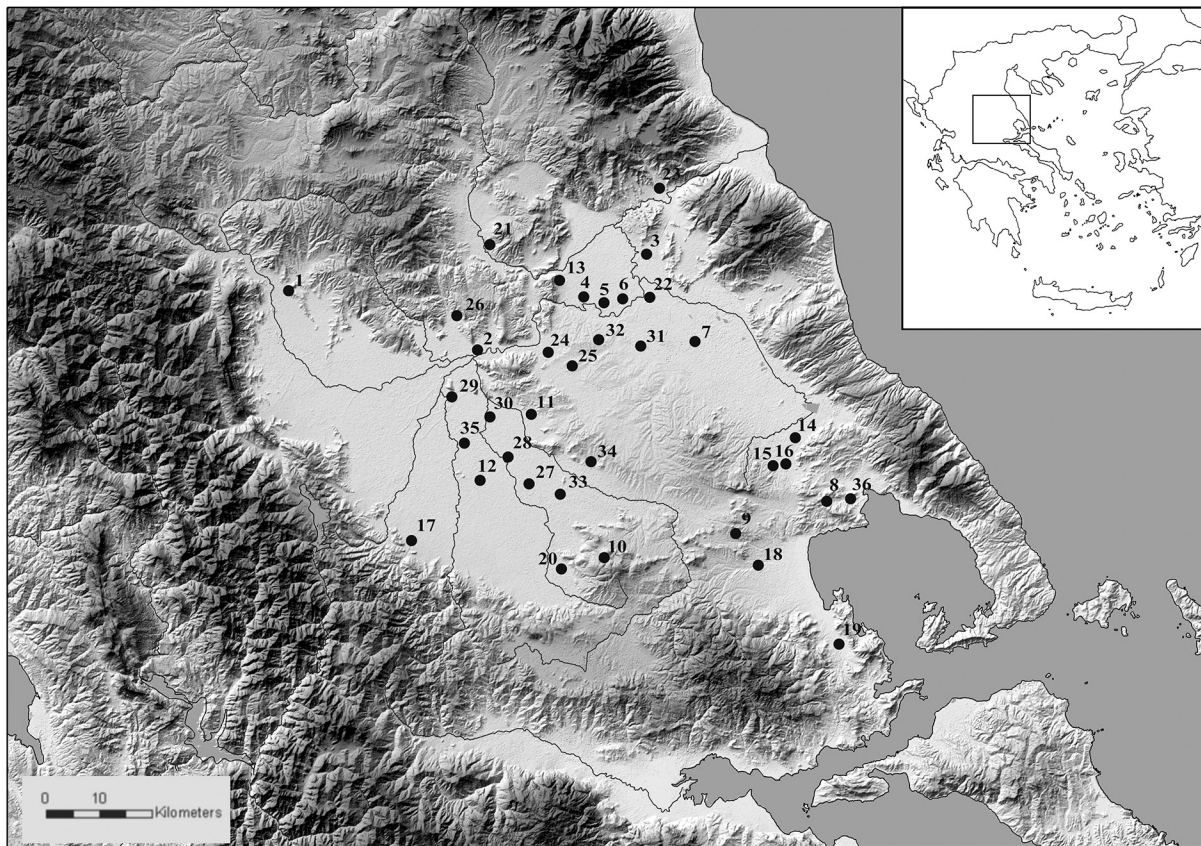


Figure 1. Map of Thessaly with the location of all the sites included in the study: (1) Theopetra Cave; (2) Platia Magoula Zarkou; (3) Makrychori 2; (4) Agia Sophia; (5) Otzaki; (6) Arapi; (7) Halki 1; (8) Sesklo; (9) Tsangli; (10) Achilleion; (11) Magoula Sykeon; (12) Orgozinos; (13) Magoula Tsalma/Tyrnavos 5; (14) Hatzimissiotiki Magoula; (15) Agrokipiou Magoula; (16) Magoula Visviki; (17) Magoula Tsapocha/Syrmou; (18) Daoutza; (19) Kamara; (20) Koutroulou Magoula; (21) Mesochori 1; (22) Soufli Magoula; (23) Gonnoi 1; (24) Nikaia 5; (25) Terpsithea 2; (26) Grizano 1; (27) Lefki Karditsas 1; (28) Ampelonas Karditsas; (29) Keramidi; (30) Itea 2; (31) Kastro 1; (32) Rachoula 1; (33) Ypereia 1; (34) Chara 2; (35) Magoula Koskina; (36) Dimini.

Otzaki, Arapi, Halki 1, Sesklo, Tsangli, Achilleion, Sykeon, Orgozinos, Agrokypiou, Hatzimissiotiki, Visviki, Tsapocha/Syrmou, Kamara, Koutroulou) and surface collections by D. R. Theocharis (Daoutza) and K. Gallis (most of them included in Gallis 1992: Mesochori 1, Soufli Magoula, Gonnoi 1, Nikaia 5, Terpsithea 2, Grizano 1, Lefki Karditsas 1, Ampelonas Karditsas, Keramidi, Itea 2, Kastro 1, Rachoula 1, Ypereia 1, Chara 2, and Magoula Koskina) (see Figure 1; for a detailed presentation of analytical data and a discussion of various aspects of research results, see Pentedeka 2008, 2011, 2012, 2015; Rondiri 2009).

After clarifying provenance and technology issues (for the former, the contribution of the raw material samples was decisive), it became apparent that certain settlements had developed distinctive fabric recipes, usually ware-specific and characterized by a rather fixed *chaîne opératoire*. These distinctive fabrics, typical for specific sites, were identified in the ceramic assemblage of a number of other Thessalian sites, thus forming common fabric groups (CFG). Further comparison with the survey pottery samples analyzed by Schneider et al. (1991) and integration of their chemical analyses results and conclusions led to very interesting findings with regard to pottery circulation alongside local pottery manufacture (Table 1).

During the MN, Red-on-White and Scraped wares presented small-scale circulation with at least one discernible production center for each (Figure 2), namely Halki 1 for Red-on-White (CFG7), and Platia Magoula Zarkou (CFG1, CFG2)—possibly also Tsangli (CFG6)—for Scraped ware, while monochrome pottery shows some mobility (CFG1), but in very low total numbers (Figure 3a–g, on Color Plate XI). Pottery circulation seems to have intensified from the LN onward (Figure 4). During its first phase (LN I), multiple networks were established, in particular for Black Burnished and Grey wares. For the latter, Platia Magoula Zarkou seems to have been a major center (CFG1–3, Figure 3h–m, on Color Plate XI), whereas production centers for Black Burnished ware include Magoula Tsalma (CFG4, Figure 5a–b, on Color Plate XII) and Makrychori 2 (CFG5, Figure 3n–o, on Color Plate XII). In the following phase, the LN II, Magoula Tsalma is attested as a major production center for the Black-on-Red ware (CFG4, Figure 5c, on Color Plate XII). Hitsiou (2003) has suggested that Dimini was the center for Brown-on-Cream ware production, but recent research indicates the existence of at least one more center that cannot be securely located at present (Pentedeka 2015:267–269).

Therefore, production centers seem to have been mostly ware-specific, with the exceptions of Platia

Magoula Zarkou, which was active in the circulation of a number of wares throughout the Neolithic, and of Magoula Tsalma during the LN. The production, and also to a lesser extent the consumption, of specific wares seems to have diversified within Thessaly. Grey ware, in its Monochrome and Grey-on-Grey decorated versions, shows higher frequency in west Thessaly. Despite the local manufacture of this ware at some sites, for instance at Magoula Sykeon (Pentedeka 2008:163–171), it is Platia Magoula Zarkou where up to 80 percent of the studied samples seem to have been produced (Pentedeka 2008:201–203). Within this production, three fabric groups (CFG1–3)—that is, three different sets of technological choices—are identified for the manufacture of vessels of the same ware (Figure 3h–m, on Color Plate XI). This differentiation is not observed in the morphological and typological attributes of Grey pottery, which is characterized by extraordinary uniformity (Demoule et al. 1988:17–23). Interregional diversification is also observed in the case of the Black Burnished and Black-on-Red wares. Although their local manufacture is attested at many sites, it is the production of Makrychori 2 (CFG5) and Magoula Tsalma (CFG4) which stand out and seems to be rather popular, especially in northeastern Thessaly (CFG5, Figure 3n–o, on Color Plate XI; CFG4, Figure 5a–c, on Color Plate XII).

The identification of a production center—that is, a way of pottery making assigned as local to one settlement and imported to another—not only relates to a specific geochemical composition (i.e. to specific raw materials used), but also includes other attributes like clay paste preparation, surface treatment, or firing. Such an example is the grog-tempering practice (CFG8) attested in the assemblages of Tsapocha, Visviki, and Agrokypiou, but also reported for Dimini, in relation primarily to Polychrome and Bichrome wares (Hitsiou 2003:152–153; Pentedeka 2015:272). Grog is usually added to clay pastes already containing non-plastic inclusions, which relate to the geological formations found in the vicinity of the site and correspond to well-defined fabrics of each settlement (Figure 5d–f, on Color Plate XII). The Polychrome and Bichrome wares seem to be related to the formation of a grog-tempering tradition attested so far only in southern Thessaly; this tradition exemplifies the sharing of beliefs and ideas rather than the circulation of pots themselves.

Thessaly is also defined by an environmental diversity combining mountains, flat plains, river valleys, lacustrine environments, and coastland. An integrated approach for the study of pottery assemblages and ceramic technology can reveal the impact of environmental factors, as much as it does human

Table 1. Main attributes characterizing the common fabric groups (CFG) and other fabrics identified within the Thessalian ceramic assemblages.

Fabric Group	Composition	Suggested Production Center	Connected Wares	Connected Sites	Timespan
CFG1	Gneiss and biotite/chlorite schist fragments petrofabric	Platia Magoula Zarkou (PMZ)	Red Monochrome Scraped Scraped/Protogrey Protogrey Grey/Grey-on-Grey	Theopetra Cave, Otzaki (OTZ), Halki 1 (H, X), Tsangli (TS), Mesochori 1, Soufli Magoula	MN-LN I
CFG2	Same petrofabric composition as in CFG1, biotite in various stages of thermal deformation; chemical group 3.2.1 (Schneider et al. 1991:54–55)	Platia Magoula Zarkou (PMZ)	Scraped Scraped/Protogrey Protogrey Grey/Grey-on-Grey	Otzaki (OTZ), Arapi, Halki 1 (H, X), Tsangli (TS), Orgozinos, Sykeon (SYK), Terpsithea 2, Grizano 1, Lefki Karditsas 1, Ampelonas Karditsas 1, Keramidi, Itea 2	MN-LN I
CFG3	Marls, quartz, feldspar, not fully burnt-out organic material petrofabric; same chemical group as CFG2	Platia Magoula Zarkou (PMZ) / West Thessaly	Protogrey Grey/Grey-on-Grey	Theopetra Cave, Makrychori 2 (M), Agia Sophia, Otzaki (OTZ), Halki 1 (H, X), Orgozinos, Sykeon (SYK), Magoula Tsalma (TSAL), Kastro 1, Rachoula 1, Ypereia 1, Chara 2, Magoula Koskina	LN I
CFG4	Quartz-rich metamorphic fragments and mineral components; chemical group 3.4.5 (Schneider et al. 1991:59, continued in 57 due to a printing mistake)	Magoula Tsalma (TSAL) / Tyrnavos area	Black Burnished Black-on-Red	Platia Magoula Zarkou (PMZ), Makrychori 2 (M), Agia Sophia, Otzaki (OTZ), Halki 1 (H, X), Magoula Visviki (MV), Magoula Tsapochoa/Symou (TSP), Kastro 1	LN I-II
CFG5	Biotite epidote amphibole schist fragments and mineral components; chemical group 3.4.1 (Schneider et al. 1991:59)	Makrychori 2 (M)	Black Burnished	Platia Magoula Zarkou (PMZ), Halki 1 (H, X), Soufli Magoula, Kastro 1	LN I

Continued on next page...

Table 1 – continued...

Fabric Group	Composition	Suggested Production Center	Connected Wares	Connected Sites	Timespan
CFG6	Fine quartz, alkali feldspar and mica petrofabric; chemical group 3.1.4 (Schneider et al. 1991:16, 54)	Tsangli (TS)? / Southeast Thessaly	Scraped	Halki 1 (H, X), Sesklo (SB)	MN
CFG7	Mica schist petrofabric (strong planar preferred orientation, lepidoblastic texture)	Halki 1 (H, X)	Red-on-White	Otzaki (OTZ), Soufli Magoula	MN
CFG8	Variable compositions, common feature is grog temper	-	Bichrome Polychrome	Agrokipiou (AGR), Magoula Visviki (MV), Magoula Tsapochoa/Syrmou (TSP)	LN I
CFG9	Micritic calcite and textural compositional features (clay pellets) petrofabric	Kamara (K)	Red-on-White	Daoutza (DA)	MN
CFG10	Altered igneous and metamorphic (greenschist) rock fragments petrofabric	Magoula Visviki (MV)	Red Monochrome	Hatzimissiotiki (HM)	MN
Indications of Surface Sediment Exploitation					
Fabric Group	Composition	Suggested Production Center	Connected Wares	Connected Sites	Timespan
-	Variable compositions, common feature is organic material (roots?)	Agrokipiou (AGR), Magoula Visviki (MV)	All wares identified within these assemblages	-	MN-LN
-	Variable compositions, common feature is organic material (roots?) and dung	Koutroulou Magoula (KTM)	All wares identified within these assemblages	-	MN

agency. On a purely analytical level, it can highlight some segments of “nature” that still survive in “culture,” to recall a popular duality. One such example within the existing sample set is the indication of the existence of stagnant waters or marshy areas around specific sites. The recurring presence of fine organic material, as incomplete infilling of predominantly elongated voids sometimes retaining the relic cellular texture, possibly indicates plant remains (e.g. roots) in the raw material source (Fitzpatrick 1990), pointing to the use of surface sediments rather than tempering with vegetal material. Such organic material is present in the Agrokipiou and Visviki Magoula assemblages, and it should relate to their location in the outlet of the drainage system of the streams originating from Chalkodonion Mountain. At Koutroulou Magoula, situated at the foot of Narthaki Mountain, again organic matter is observed, this time accompanied by phytoliths and phosphates, suggesting the presence of dung in the surface sediments that were used, and possibly locating them very close to, if not within,

the settlement (Figure 5g–j, on Color Plate XII).

On a different level of observation, it can be argued that the natural environment may favor the formation of micro-networks: examples of such micro-networks are revealed in distinct geomorphological entities such as the Almyros basin and Lake Karla. At Almyros, the petrographic analysis of selected samples deriving from Kamara and Daoutza showed the existence of a small local network related mainly to the MN Red-on-White ware (CFG9, Figure 5k–m, on Color Plate XII). This calcareous fabric includes a few incised and almost half of the Red-on-White samples from Kamara, and is very similar in texture and composition to a raw material sample collected from the vicinity of the site (Figure 5k, on Color Plate XII; ATS140, collected by Colette Beestman-Kruyshaar for her Ph.D. research on Hellenistic Halos, Universiteit van Amsterdam). It is considered to be local to Kamara, while it is also attested in a small number of Red-on-White samples from Daoutza, probably indicating the existence of a localized Almyros network.

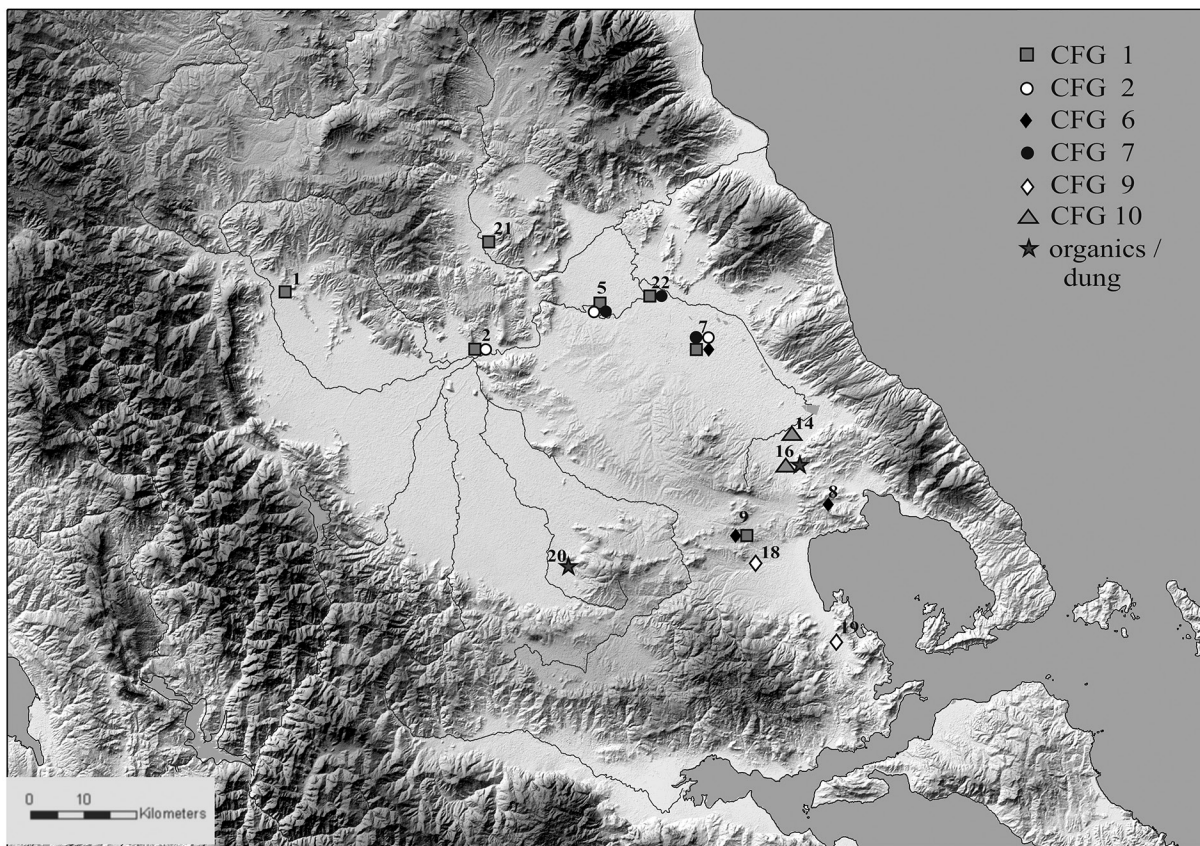


Figure 2. Distribution of the identified common fabric groups (CFGs) and their probable production center in the MN (sites numbered as in Figure 1): CFG1, Platia Magoula Zarkou (Scraped and Grey-on-Grey ware); CFG2, Platia Magoula Zarkou (Grey-on-Grey ware); CFG6, Tsangli? (Scraped ware); CFG7, Halki 1 (Red-on-White ware); CFG9, Kamara (Red-on-White ware); CFG10, Visviki (Red Monochrome ware).

At Karla, the petrographic analysis of selected samples deriving from Agrokipiou and Visviki resulted in the distinction of large fabric groups, undisputedly of local origin to each site, as they are compatible to local geology and match raw materials that were sampled (Pentedeka 2015). Nevertheless, all these fabrics present significant internal variability with regard to the relative proportions of the various components, suggesting clay paste recipes that are not standardized. In this case, however, it rather reflects the natural variability within the raw material sources, possibly as a result of climatic conditions and the hydrological instability of the region, as best exemplified in the case of Lake Karla. The lake was shallow, especially at its western and northern limits, resulting in severe fluctuation of the total area occupied by the lake and a changing shoreline during times of increased water supply (Ananiadis 1956; Constantinidis 1988:211; Demitrack 1994:39; Moumou 2007:70–72; Moumou et al. 2010, note the shoreline migration stages in Figure 4, and the

estimated 4.5 km displacement in the western part of the lake). With regard to the Neolithic period, there is no consensus on the maximum water level or size of Lake Karla (Alexakis 2009:85–88; Alexakis et al. 2011:92–93; Caputo et al. 1994:226; Grundmann 1937:56–61; Halstead 1984:36–37; Schneider 1961). More significantly, however, it is difficult to estimate the coverage of stagnant waters or marshy areas, as a result of the drainage system of the complex stream network of the surrounding hillsides and the recession of the lakeshore, evidently affecting the landscape experience (Alexakis 2009:Figures 5.2–5.3; Constantinidis 1988:211; Moumou 2007:35, 39, 66–153, Figures 5.1–5.2; Moumou et al. 2010; Palikaridou 1998:29–32, Figures 1.5.2–1.5.3). The complex stream network could have caused circumstantial blending and internal variability to the raw material sources used by the neighboring sites of Agrokipiou and Visviki Magoules, the main fabrics of which display considerable compositional similarity, that should not be immediately associated with exchange

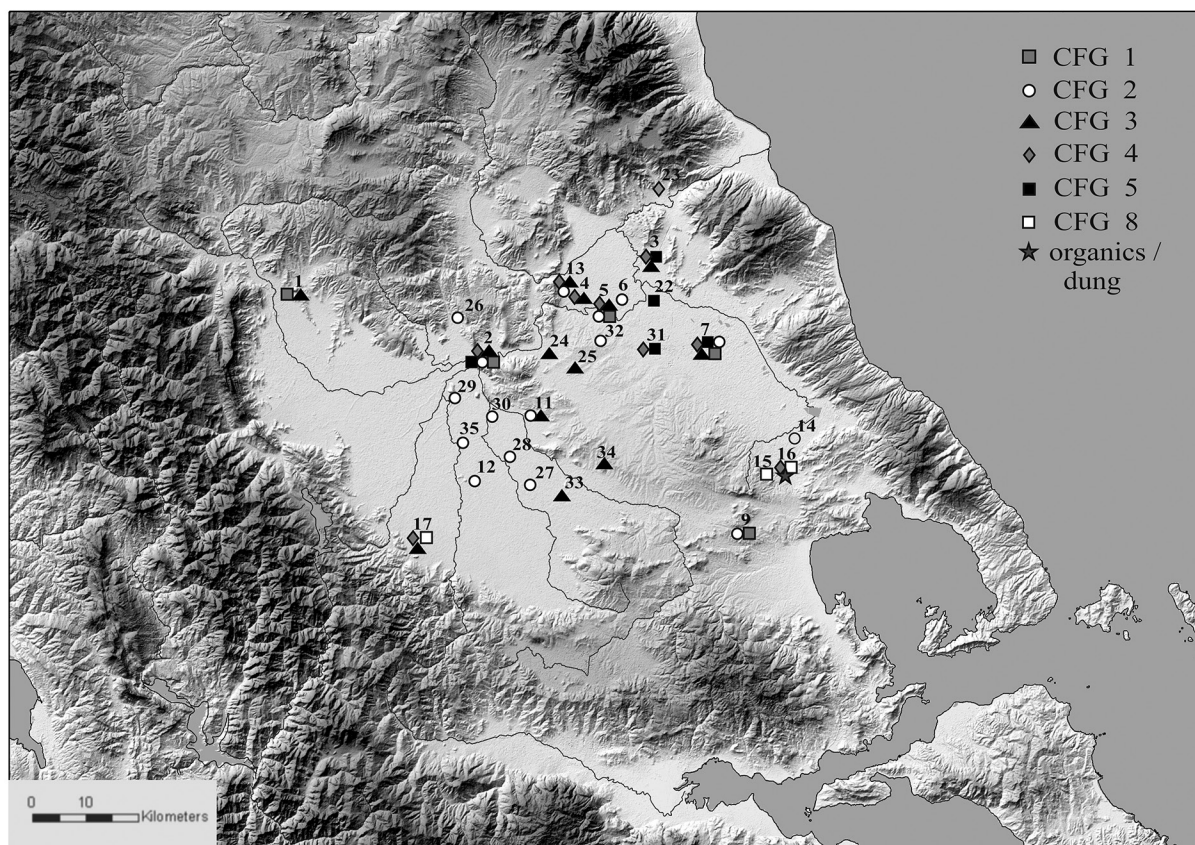


Figure 4. Distribution of the identified common fabric groups (CFGs) and their probable production center in the LN (sites numbered as in Figure 1): CFG1, Platia Magoula Zarkou (Scraped and Grey-on-Grey ware); CFG2, Platia Magoula Zarkou (Grey-on-Grey ware); CFG3, Platia Magoula Zarkou (Grey-on-Grey ware); CFG4, Magoula Tsalma (Black Burnished and Black-on-Red ware); CFG5, Makrychori 2 (Black-on-Red ware); CFG8, grog fabric (Bichrome and Polychrome ware).

practices. This applies also for Halki 1, situated at the northern edge of the Karla basin, where the internal variability within its local fabrics is striking (Pentedeke 2008:131–141, 353–374, Figures 6.78–6.92), and partially for Hatzimissiotiki, which is considered to have always been an island within the lake (Alexakis 2009:86–87; Palikaridou 1998:71–74). On the basis of the analyzed samples, some of the Hatzimissiotiki fabrics seem to relate to sources to the southwest of the site, while other fabrics are very similar to distinctly local Visviki (Figure 5n–o, on Color Plate XII) and Dimini fabrics. The ratio of local and assumed imported pottery to the settlement is higher than what is attested at other sites, while Halki 1 is the only site from those examined so far that participated in almost all identified networks.

Landscapes and Exchange

Before attempting interpretations of all the above, it would be useful to clarify some fundamental issues when discussing pottery exchange networks via connectivity schemes, especially in societies without a market economy. Connectivity is archaeologically perceived through the neutralizing detection of networks resulting from the distribution of artifacts or raw materials deriving from a specific and known source. In the case of pottery, what can be identified are its source and its last use/discard place, thus testifying to its circulation and manifesting connectivity; what is almost impossible to reconstruct, however, is the exact route, which was not necessarily direct from the production center to the final findspot. Exchange, therefore, is inferred from the movement of things and people in the landscape (Ingold 2000:187–208, 2011:145–155), exhibiting the inherent spatial dimension within the entire meshwork of intertwined trails along which people carry on their lives. More important, however, is the internal temporal dimension that lies always behind this kind of interaction (Bourdieu 1977:5–9). The distinction between connectivity and exchange, therefore, is to specify what is given in return (be it material or immaterial), and when. The degree of preservation of the archaeological record does not allow for a complete reconstruction of this interaction, at least in the case of Neolithic Thessaly. Nevertheless, the action of giving and taking/receiving unfolds within a specific context and for specific reasons that deserve our interest, and can be depicted as a network of interactions between people and things. Such networks are topologically composed of nodes and links (Knappett 2006:242) and resemble in essence more of a tangled mesh of interwoven and complexly knotted threads, in which

every thread is a way of life (the social context of the action), and every knot a place (Ingold 2007:72–84). As Ingold aptly argued, in exemplifying the distinction between a network and a meshwork, “the key is the recognition that the lines of the meshwork are not connectors. They are the paths *along* which life is lived. And it is in the binding together of lines, not in the connecting of points, that the mesh is constituted” (Ingold 2011:150–151; emphasis in original). When applied to the archaeological record, meshworks are less tangible than networks; they can be mapped with nodes being the sites (synthesis of persons and things, the “place” in Ingold’s terms) as well as the agents of exchange (in the tangible form of an object). The links (not always retrieved in detail) are the connections developed among such nodes, rendering space a familiar landscape (a “meshwork”) by denoting interaction among and between people and things (in our case, the pots).

Returning to pottery circulation in Neolithic Thessaly, in assessing the ways the discerned networks are structured, various patterns of settlement involvement can be identified, depending on the intensity, degree, and form of participation for each settlement (Pentedeke 2008:197–210). The links observed between particular settlements during the MN continued and intensified in the LN. This applied especially to the network of relations developed by the inhabitants of Platia Magoula Zarkou during the MN, which included Theopetra Cave, Otzaki, Halki 1, and Tsangli. This network survived in the following period, experiencing a significant expansion by including many other settlements throughout Thessaly. In an overall assessment of all networks for both periods, the settlements of Platia Magoula Zarkou, Magoula Tsalma, Otzaki, Makrychori 2, Tsangli, and Halki 1 stand out as diachronically important nodes, although the degree and form of participation is variable for each settlement, resulting in three different patterns of settlement involvement in exchange networks. The first pattern includes the “source” settlements (i.e. settlements that are active primarily as production centers for the networks they participate in). Platia Magoula Zarkou is the only settlement where this pattern is recognized, and it could be characterized as a diachronic “source” settlement. The second pattern includes settlements which act as “source” settlements in some of the networks they participate in, while in others they operate as “recipient” settlements, demonstrating relatively balanced reciprocal relations. The most characteristic example of this pattern is Magoula Tsalma (to a smaller extent, also Makrychori 2 and Tsangli). Finally, the third pattern concerns settlements that appear to act primarily as

“recipient” settlements in the networks they participate in, like Otzaki or Halki 1. Halki 1, in particular, represents a diachronic “recipient” settlement, being the only site from those examined so far that participates in almost all the identified networks.

Here it would be useful to open a parenthesis and refer briefly to the networks attested to by the chipped stone industry of Thessaly during the Neolithic, for obvious comparative reasons. Karimali (2009) has described the two major lithic exchange networks active in Thessaly: that of the obsidian from Melos, and that of the chocolate flint from the Pindos Mountains. Obsidian is widespread at the coastal sites, usually imported in the form of semi-prepared and prepared cores, and it is observed at several sites in the eastern Thessalian Plain, either in the form of prepared cores or in later stages of production (e.g. blades or finished tools). Chocolate flint predominates in the western Thessalian Plain, where all sites present the entire production sequence, while in the eastern plain it is usually found in the form of flakes which were then processed further. All the Thessalian sites seem to have possessed the know-how for stone tool making, although it was performed on different raw materials. The reconstruction of the *chaîne opératoire* is also used in the case of lithics to determine the exact stage of importation to each site, that is, as raw material, prepared cores, formed but unfinished tools, or finished items (Karimali 2001:756–757). Each of these stages implies different on-site reduction strategies and organization of production.

Returning to the pottery meshwork of Neolithic Thessaly, it should not be a mere coincidence that the settlements standing out as diachronically important nodes were, with rare exceptions, inhabited for thousands of years, forming visible tells in the Thessalian Plain. It has been suggested that tells are a clear mark of continuity and symbolic relation to the ancestors and so provide prominent monuments as fixed places in the landscape (Kotsakis 1999). The parallel activity of different networks observed in pottery applies also to chipped stone raw material networks, which co-exist and overlap. It should be emphasized, however, that the conditions of participation in or exclusion from a network are not formed on geographical terms of distance to the source (Karimali 2005). The temporal dimension of exchange is probably more decisive than the spatial one, and the emerging patterns are depictions of a palimpsest of movements, meaningful strands of past ways of life.

Unfortunately, it is usually not feasible to suggest or reveal the context of movement; however, these nodes (or knots) should not be envisaged as

some form of primitive markets, but rather as places where the use of pots made elsewhere (the outcome of exchange) formed or transformed the individual and/or collective identities of the agents. Similarly, ethnographic studies suggest the practice of grog-tempering, as observed in the LN Polychrome and Bichrome wares of southern Thessaly. It is usually symbolically charged, and its choice should be more significant for the producers as members of certain social groups (e.g. Rainbird 1999). Such concepts comprise part of technological traditions, embedded in a society’s system of beliefs, concepts, and practices and transmitted through close social contacts, usually kin-based and often related to marriage networks (as in, for example, Dobres 1999, 2000; Gosselain 1998). In the same line of reasoning, the intense connectivity observed at the settlements related to Karla (Halki 1, Hatzimissiotiki), although difficult to be fully explained with the present data, may have constituted a safety networking in times of need (excessive flooding episodes, loss of crops, etc.; a rough parallel can be the notion of “social storage” in Halstead and O’Shea [1982]).

Conclusions

The integrated approach for the study of pottery assemblages and ceramic technology has revealed the existence of different production centers, most frequently ware-specific, the parallel activity of different exchange networks, and the variability of distribution patterns of the pottery that was produced. The concept of the *chaîne opératoire* proved to be very useful for the understanding of certain aspects of exchange networks for both pottery and lithics. Especially for pottery, it facilitated in the identification of a number of fabrics, usually ware-specific and associated with exchange networks, which were characterized by different organization patterns and degrees of site involvement. The connotations of these finds are significant for the unraveling of the complex relations developed between settlements situated in different micro-environments and the recognition of interregional diversification in Thessaly. Exchange as a form of networking constitutes a fluid frame of practice, since the agents involved are not only people but also objects, in this case pots: they “attach people because they circulate in their hands and define their social bond by their very circulation” (Latour 1991:89). The study of exchange and its networks reveals a new perception of the Thessalian landscape within the Neolithic cosmos, which appears less uniform and more segmented, yet more “human” than originally considered.

Acknowledgments

The author would like to thank Univ.-Doz. Dr. E. Alram, Prof. K. Gallis, Prof. Y. Hamilakis, L. Hatziangelakis, Prof. K. Kotsakis, Dr. A. Kyprissi-Apostolika, E. Nikolaou, Dr. V. Rondiri, Prof. G. Schneider, and G. Toufexis for entrusting me with the study of their material; Dr. P. Koutsovitis, K. Papaspyropoulos, and Dr. S. Valkaniotis for geological information and mapping; the ΙΓ', ΙΕ', and ΛΔ' Ephorates, the Ephorate of Palaeoanthropology and Speleology of Southern Greece, and the Institute of Geology and Mineral Exploration for issuing the sampling permits; the British School at Athens and the Fitch Laboratory for infrastructure use during PhD research and manifold support as Williams Fellow in Ceramic Petrology. This study would not have been completed without the support of the following funding bodies: Aristotle University of Thessaloniki – Research Committee, Institute for Aegean Prehistory, The A.G. Leventis Foundation, Der Wissenschaftsfonds, Österreichische Akademie der Wissenschaften, The British Academy, and Psychas Foundation. The anonymous referees are sincerely thanked for their constructive remarks; any mistakes remain the responsibility of the author.

References Cited

- Alexakis, Dimitrios
2009 Η Συμβολή της Γεωμορφολογίας με τη Βοήθεια της Τηλεπισκόπησης και των Γεωγραφικών Συστημάτων Πληροφοριών στη Χαρτογράφηση Αρχαιολογικών Θέσεων. Ph.D. dissertation, Aristotle University of Thessaloniki. Available online, <http://invenio.lib.auth.gr/record/113472?ln=el>, accessed October 11, 2015.
- Alexakis, Dimitrios, Apostolos Sarris, Theodoros Astaras, and Konstantinos Albanakis
2011 Integrated GIS, Remote Sensing and Geomorphologic Approaches for the Reconstruction of the Landscape Habitation of Thessaly during the Neolithic Period. *Journal of Archaeological Science* 38:89–100.
- Alram-Stern, Eva
2015 Die Keramik. Einleitung. In *Die Deutschen Ausgrabungen 1941 auf der Visviki-Magula/Velestino: Die Neolithischen Befunde und Funde*, edited by Eva Alram-Stern and Angelika Dousougli-Zachos, pp. 91–101. Beiträge zur ur- und Frühgeschichtlichen Archäologie des Mittelmeer-Kulturräumcs Vol. 36. Dr. Rudolf Habelt, Bonn.
- Ananiadis, Constantine
1956 Limnological Study of Lake Karla. *Bulletin de l'Institut Océanographique* 1083:1–19.
- Bourdieu, Pierre
1977 *Outline of a Theory of Practice*. Cambridge University Press, Cambridge.
- Caputo, Riccardo, Jean-Paul Bravard, and Bruno Helly
1994 The Pliocene-Quaternary Tecto-sedimentary Evolution of the Larissa Plain (Eastern Thessaly, Greece). *Geodynamica Acta* 7(4):19–231.
- Constantinidis, Dimitrios
1988 Η Ιζηματογένεση και η Ηλικία της Αποξηραμένης Λίμνης Κάρλας. *Bulletin of the Geological Society of Greece* 20(2):209–222.
- Cresswell, Robert
1996 *Prométhée ou Pandore? Propos de Technologie Culturelle*. Éditions Kimé, Paris.
- Demitrack, Anne
1994 A Dated Stratigraphy for the Late Quaternary in Eastern Thessaly and What it Implies about Landscape Changes. In *La Thessalie. Quinze Années de Recherches Archéologiques, 1975–1990: Bilans et Perspectives. Actes du Colloque International, Lyon, 17–22 Avril 1990*, Vol. A, edited by Jean-Claude Decourt, Bruno Helly, and Kostas Gallis, pp. 37–40. Kapon Editions, Athens.
- Demoule, Jean-Paul, Kostas Gallis, and Laurence Manolakakis
1988 Transition entre les Cultures Néolithiques de Sesklo et de Dimini: Les Catégories Céramiques. *Bulletin de Correspondance Hellénique* 112:1–58.
- Dobres, Marcia-Anne
1999 Technology's Links and Chaînes: The Processual Unfolding of Technique and Technician. In *The Social Dynamics of Technology: Practice, Politics, and World Views*, edited by Marcia-Anne Dobres and Christopher R. Hoffman, pp. 124–146. Smithsonian Institution Press, Washington.
- 2000 *Technology and Social Agency: Outlining a Practice Framework for Archaeology*. Blackwell, Oxford.
- Fitzpatrick, Ewart Adsil
1990 Roots in Thin Sections of Soils. *Developments in Soil Science* 19:9–23.
- Gallis, Kostas
1992 *Ατλας Προϊστορικών Οικισμών της Ανατολικής Θεσσαλικής Πεδιάδας*. Society of Historical Research of Thessaly, Larisa.

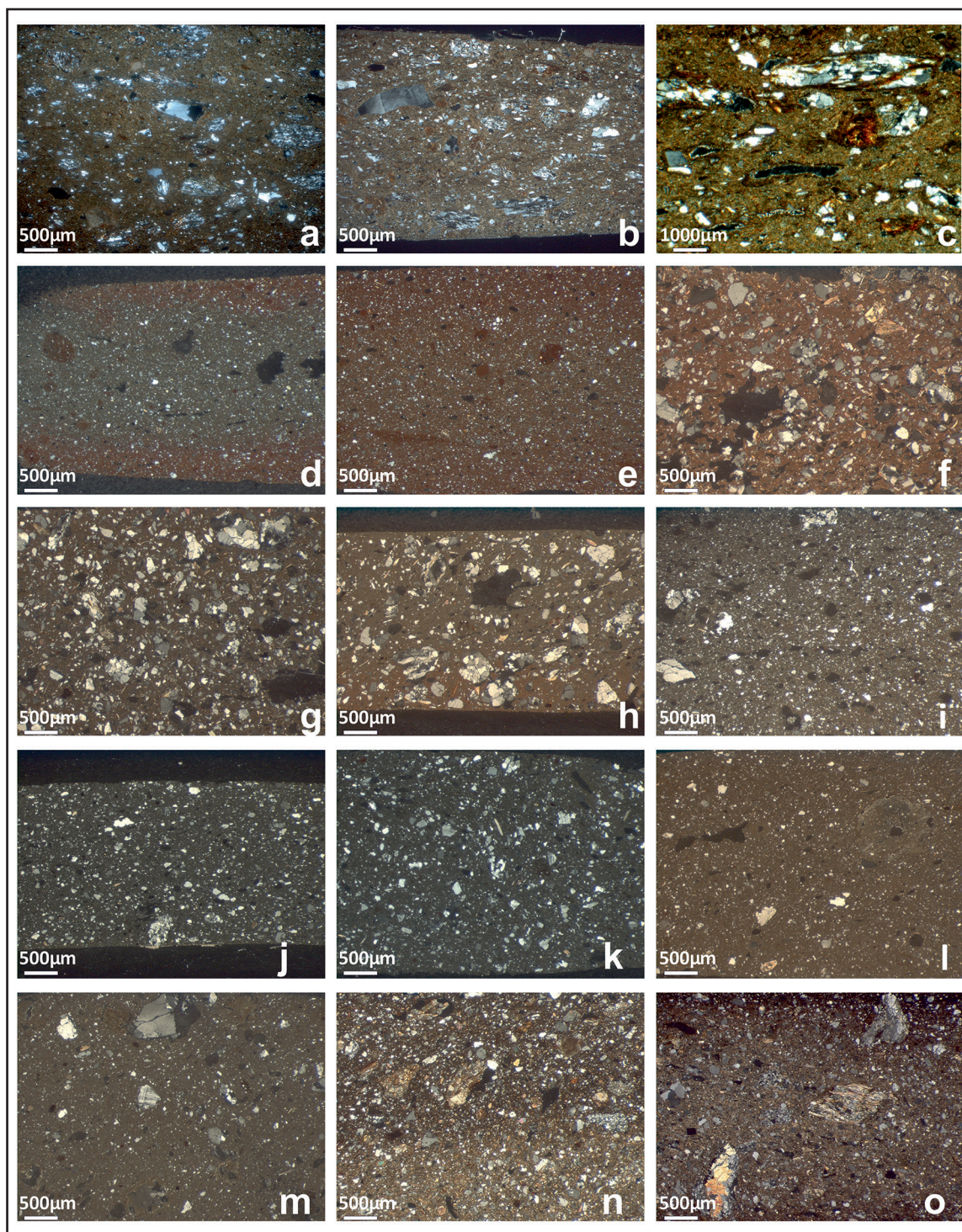
- Gosselain, Oliver
1998 Social and Technical Identity in a Clay Crystal Ball. In *The Archaeology of Social Boundaries*, edited by Miriam T. Stark, pp. 78–106. Smithsonian Institution Press, Washington.
- Grundmann, Kimon
1937 Magula Hadzimissiotiki. Eine steinzeitliche Siedlung im Karla-See. *Athenische Mitteilungen* 62:56–69.
- Halstead, Paul
1984 Strategies for Survival: An Ecological Approach to Social and Economic Change in the Early Farming Communities of Thessaly, N. Greece. Unpublished Ph.D. dissertation, University of Cambridge.
- Halstead, Paul, and John O'Shea
1982 A Friend in Need is a Friend Indeed: Social Storage and the Origins of Social Ranking. In *Ranking, Resource and Exchange: Aspects of the Archaeology of Early European Prehistory*, edited by Colin Renfrew and Steven Shennan, pp. 92–99. Cambridge University Press, Cambridge.
- Hauptmann, Harald
1981 *Die Deutschen Ausgrabungen auf der Otzaki-Magula in Thessalien: 3. Das Späte Neolithikum und das Chalkolithikum*. Beiträge zur ur- und Frühgeschichtlichen Archäologie des Mittelmeer-Kulturräumes Vol. 21. Dr. Rudolf Habelt, Bonn.
- Hitsiou, Elissavet
2003 Production and Circulation of the Late Neolithic Pottery from Makrygialos (Phase II), Macedonia, Northern Greece. Unpublished Ph.D. dissertation, University of Sheffield.
- Ingold, Tim
2000 *The Perception of the Environment: Essays in Livelihood, Dwelling and Skill*. Routledge, London.
2007 *Lines: A Brief History*. Routledge, London.
2011 *Being Alive: Essays on Movement, Knowledge and Description*. Routledge, London.
- Karimali, Lia
2001 Επαναπροσδιορισμός της Συχνότητας Υλικού και της Απόστασης στα Μοντέλα Ανταλλαγής Οψιανού στο Αιγαίο: Η Περίπτωση της Θεσσαλίας. In *Archaeometry Issues in Greek Prehistory and Antiquity*, edited by Yannis Bassiakos, Eleni Aloupi, and Yorgos Facorellis, pp. 753–761. Hellenic Society of Archaeometry and Society of Messenian Archaeological Studies, Athens.
- 2005 Inferences and Limitations in Chipped-Stone Modeling: Learning from an Ethnoarchaeological Case (Threshing-Sledge Production in Thessaly, Greece). In *Lithic Toolkits in Ethnoarchaeological Contexts*, edited by Xavier Terradas, pp. 47–56. Acts of the XIVth UISPP Congress, University of Liege 2001. BAR International Series 1370. British Archaeological Reports, Oxford.
- 2009 Κατανομή Λίθινων Πρώτων Υλών στη Νεολιθική Θεσσαλία: Μια Συγκριτική Εξέταση. In *Πρακτικά Επιστημονικής Συνάντησης, Βόλος 16.3–19.3.2006: 1. Θεσσαλία*, edited by Alexandros Mazarakis Ainian, pp. 17–29. Archaeological Meeting of Thessaly and Central Greece 2. Ministry of Culture and the University of Thessaly, Volos.
- Knappett, Carl
2006 Beyond Skin: Layering and Networking in Art and Archaeology. *Cambridge Archaeological Journal* 16:239–251.
- Kotsakis, Kostas
1983 Κεραμική Τεχνολογία και Κεραμική Διαφοροποίηση: Προβλήματα της Γραπτής Κεραμικής της Μέσης Νεολιθικής Εποχής του Σέσκλου. Unpublished Ph.D. dissertation, Aristotle University of Thessaloniki.
1999 What Tells Can Tell: Social Space and Settlement in the Greek Neolithic. In *Neolithic Society in Greece*, edited by Paul Halstead, pp. 66–76. Sheffield Studies in Aegean Archaeology 2. Sheffield Academic Press, Sheffield.
- Kyparissi-Apostolika, Nina
2000 The Neolithic Period in Theopetra Cave. In *Theopetra Cave: Twelve Years of Excavation and Research 1987–1998. Proceedings of the International Conference, Trikala, 6–7 November 1998*, edited by Nina Kyparissi-Apostolika, pp. 181–234. Ministry of Culture, Athens.
- Latour, Bruno
1991 *We Have Never been Modern*. Harvard University Press, Cambridge, Massachusetts.
1993 Ethnography of a “High-Tech” Case: About Aramis. In *Technological Choices: Transformations in Material Culture Since the Neolithic*, edited by Pierre Lemonnier, pp. 372–398. Routledge, London.
- Latour, Bruno, and Pierre Lemonnier
1994 Introduction: Genèse Sociale des Techniques, Genèse Technique des Humains. In

- De la Préhistoire aux Missiles Balistiques. L'Intelligence Sociale des Techniques*, edited by Bruno Latour and Pierre Lemonnier, pp. 9–24. Editions La Découverte, Paris.
- Lemonnier, Pierre
 1976 La Description des Chaînes Opératoires: Contribution à l'Analyse des Systèmes Techniques. *Techniques et Culture* 1:100–151.
 1993 Introduction. In *Technological Choices: Transformations in Material Culture Since the Neolithic*, edited by Pierre Lemonnier, pp. 1–35. Routledge, London.
- Milojčić, Vladimir
 1960 *Hauptergebnisse der Deutschen Ausgrabungen in Thessalien 1953–1958*. Dr. Rudolf Habelt, Bonn.
- Mottier, Yvette
 1981 *Die Deutschen Ausgrabungen auf der Otzaki-Magula in Thessalien: 2. Das Mittlere Neolithikum*. Beiträge zur ur- und Frühgeschichtlichen Archäologie des Mittelmeer-Kulturräumes Vol. 22. Dr. Rudolf Habelt, Bonn.
- Moumou, Chrissi
 2007 Η Δράση των Χειμάρρων της Λεκάνης της Κάρλας σε Φυσικό και Ανθρωπογενές Περιβάλλον. Ph.D. dissertation, Aristotle University of Thessaloniki. Available online, <http://invenio.lib.auth.gr/record/100713?ln=el>, accessed October 11, 2015.
- Moumou, Chrissi, Kostas Vouvalidis, Sofia Pechlivanidou, and Panagiotis Nikolaou
 2010 The Fluvial Action of the Karla Basin Streams in a Natural and Man-Made Environment. *Bulletin of the Geological Society of Greece* 43(2):706–714.
- Palikaridou, Anthoula
 1998 Οι Παλαιοακτές της τέως Λίμνης Κάρλας. Unpublished Ph.D. dissertation, Aristotle University of Thessaloniki.
- Pentedeke, Areti
 2008 Δίκτυα Ανταλλαγής της Κεραμικής κατά τη Μέση και Νεότερη Νεολιθική στη Θεσσαλία. Ph.D. dissertation, Aristotle University of Thessaloniki. Available online, <http://invenio.lib.auth.gr/record/110203?ln=en>, accessed October 11, 2015.
 2011 Links of Clay in Neolithic Greece: The Case of Platia Magoula Zarkou. In *Tracing Prehistoric Social Networks through Technology: A Diachronic Perspective on the Aegean*, edited by Ann Brysbaert, pp. 106–125. Routledge, London.
- 2012 Δίκτυα Ανταλλαγής της Κεραμικής στη Νεολιθική Θεσσαλία: Κόμβοι και Σύνδεσμοι, Οικισμοί και Σχέσεις. In *Πρακτικά Επιστημονικής Συνάντησης, Βόλος 15.3–15.3.2009: 1. Θεσσαλία*, edited by Alexandros Mazarakis Ainian, pp. 45–56. Archaeological Meeting of Thessaly and Central Greece 3. Ministry of Culture and Tourism and the University of Thessaly, Volos.
- 2015 Technological and Provenance Study of the Visviki Magoula Ceramic Assemblage. In *Die Deutschen Ausgrabungen 1941 auf der Visviki-Magula/Velestino: Die Neolithischen Befunde und Funde*, edited by Eva Alram-Stern and Angelika Dousougli-Zachos, pp. 222–297. Beiträge zur ur- und Frühgeschichtlichen Archäologie des Mittelmeer-Kulturräumes Vol. 36. Dr. Rudolf Habelt, Bonn.
- Perlès, Catherine
 1990 L'Outillage de Pierre Taillée Néolithique en Grèce: Approvisionnement et Exploitation des Matières Premières. *Bulletin de Correspondence Hellénique* 114(1):1–42.
 1992 Systems of Exchange and Organization of Production in Neolithic Greece. *Journal of Mediterranean Archaeology* 5:115–164.
 2007 Échanges et Technologie: l'Exemple du Néolithique. In *XXVIe Congrès Préhistorique de France, Avignon-Bonnieux, 21–25 Septembre 2004, Congrès du Centenaire: Un Siècle de Construction du Discours Scientifique en Préhistoire*, Vol. 3, pp. 53–62. Société Préhistorique Française, Paris.
 2012 Le Statut des Échanges au Néolithique. *Rubricatum: Revista del Museu de Gavà* 5:539–546.
- Perlès, Catherine, and Karen D. Vitelli
 1999 Craft Specialization in the Neolithic of Greece. In *Neolithic Society in Greece*, edited by Paul Halstead, pp. 96–107. Sheffield Studies in Aegean Archaeology 2. Sheffield Academic Press, Sheffield.
- Pfaffenberger, Bryan
 1999 Worlds in the Making: Technological Activities and the Construction of Intersubjective Meaning. In *The Social Dynamics of Technology: Practice, Politics, and World Views*, edited by Marcia-Anne Dobres and Christopher R. Hoffman, pp. 147–164.

- Smithsonian Institution Press, Washington D.C.
- Rainbird, Paul
1999 Entangled Biographies: Western Pacific Ceramics and the Tombs of Pohnpei. *World Archaeology* 31:214–224.
- Reinders, H. Reinder (editor)
2004 *Prehistoric Sites at the Almyros and Sourpi Plains (Thessaly, Greece)*. Royal Van Gorcum, Assen.
- Renfrew, Colin
1972 *The Emergence of Civilisation: The Cyclades and the Aegean in the Third Millennium BC*. Methuen, London.
- Renfrew, Colin, Johnston R. Cann, and John E. Dixon
1965 Obsidian in the Aegean. *The Annual of the British School at Athens* 60:225–247.
- Rondiri, Vasso
2009 Θεσσαλική Νεολιθική Κεραμική: Τεχνολογία και Κατανομή στο Χώρο. Ph.D. dissertation, Aristotle University of Thessaloniki. Available online, <http://invenio.lib.auth.gr/record/114741/?ln=el>, accessed October 11, 2015.
- Roux, Valentine
2016 Ceramic Manufacture: The *Chaîne Opératoire* Approach. In *Oxford Handbook of Archaeological Ceramic Analysis*, edited by Alice Hunt, pp. 101–113. Oxford University Press, Oxford.
- Schneider, Gerwulf, Heinz Knoll, Kostas Gallis, and Jean-Paul Demoule
1991 Transition entre les Cultures Néolithiques de Sesklo et de Dimini: Recherches Minéralogiques, Chimiques et Technologiques sur les Céramiques et les Argiles. *Bulletin de Correspondance Hellénique* 115:1–64.
- Schneider, Horst Ernst
1961 Über den Thessalischen See. *Annales Géologiques des Pays Helléniques* 12:315–317.
- Sillar, Bill, and Michael S. Tite
2000 The Challenge of “Technological Choices” for Materials Science Approaches in Archaeology. *Archaeometry* 42:2–20.
- Theocharis, Dimitrios R.
1967 *Η Αυγή της Θεσσαλικής Προϊστορίας: Αρχή και Πρώιμη Εξέλιξη της Νεολιθικής*. Filarkhaios Society of Volos, Volos.
1973 *Νεολιθική Ελλάδα*. National Bank of Greece, Athens.
- Tsountas, Christos
2000 [1908] *Αι Προϊστορικάί Ακροπόλεις Διμηνίου και Σέσκλου*. The Archaeological Society at Athens, Athens.
- van der Leeuw, Sander E.
1993 Giving the Potter a Choice: Conceptual Aspects of Pottery Techniques. In *Technological Choices: Transformations in Material Culture Since the Neolithic*, edited by Pierre Lemonnier, pp. 238–288. Routledge, London.
- Vitelli, Karen D.
1993 Power to the Potters. Comment on Perlès’ “Systems of Exchange and Organization of Production in Neolithic Greece” (JMA 5:115–64). *Journal of Mediterranean Archaeology* 6:247–257.
- Wace, Alan John Bayard, and Maurice Scott Thompson
1912 *Prehistoric Thessaly*. Cambridge University Press, Cambridge.
- Whitbread, Ian K.
1995 *Greek Transport Amphorae. A Petrological and Archaeological Study*. Fitch Laboratory Occasional Paper 4. The British School at Athens, Athens.
2001 Ceramic Petrology, Clay Geochemistry and Ceramic Production: From Technology to the Mind of the Potter. In *Handbook of Archaeological Sciences*, edited by Don R. Brothwell and A. Mark Pollard, pp. 449–459. John Wiley and Sons, London.
- YPPOT
2012 2000–2010 Από το Ανασκαφικό έργο των Εφορειών Αρχαιοτήτων. Ministry of Culture and Tourism, Athens. Available online, www.yppo.gr/0/anaskafes/pdfs/IE_EPKA.pdf, accessed October 11, 2015.

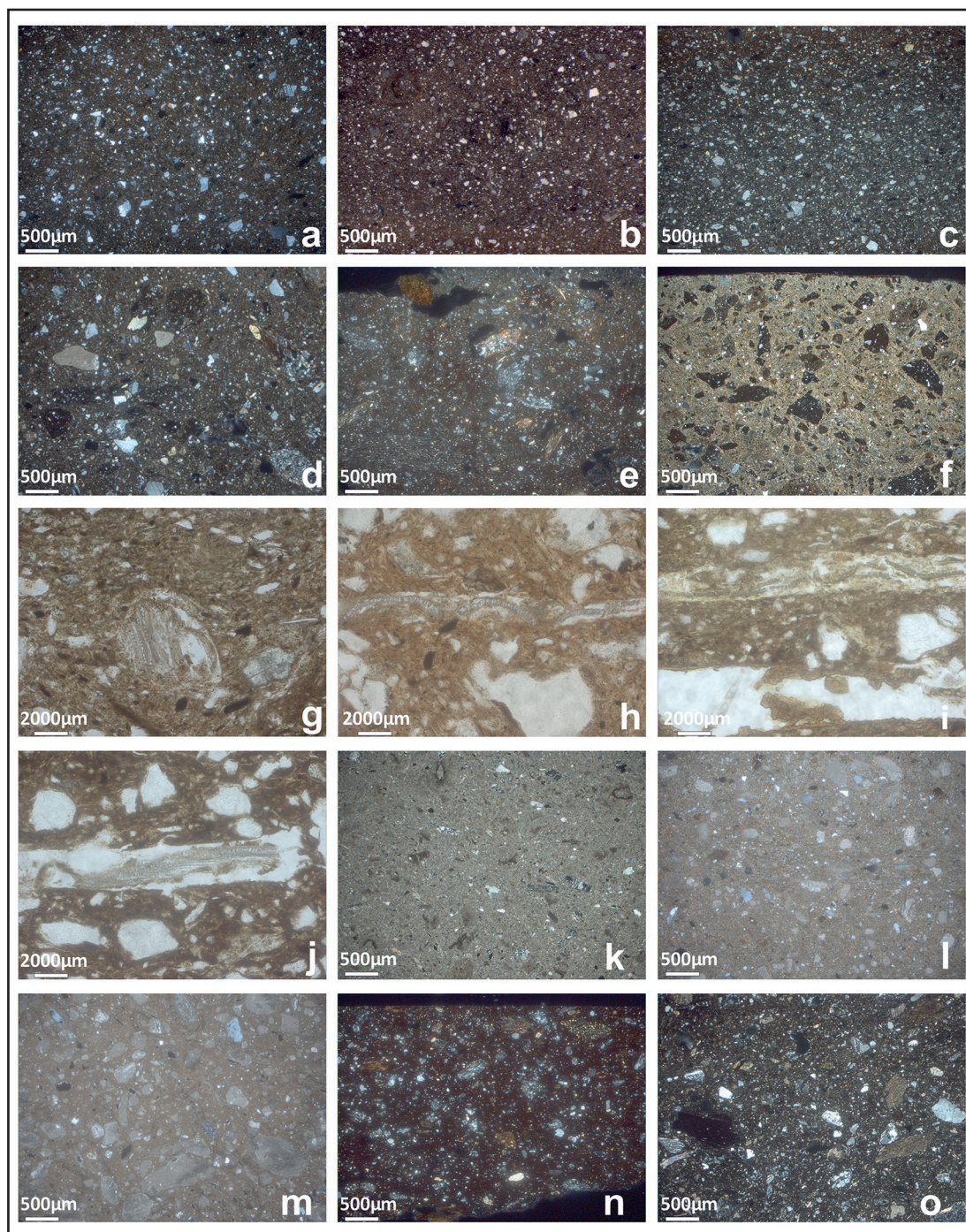
Color Plates

Plate XI



Chapter 23, Figure 3. Microphotographs illustrating the main common fabric groups (CFGs) identified within the Thessalian ceramic assemblages: (a) CFG7, Red-on-White ware, H11/1; (b) CFG7, Red-on-White ware, OTZ11/8; (c) CFG7, Red-on-White ware, 186; (d) CFG6, Scraped ware, TS10; (e) CFG6, Scraped ware, SB40; (f) CFG1, Scraped ware, PMZ23; (g) CFG1, Scraped ware, X25; (h) CFG1, Grey ware, OTZ47; (i) CFG2, Grey ware, PMZ56; (j) CFG2, Grey ware, SYK29; (k) CFG2, Grey ware, TS37; (l) CFG3, Grey ware, PMZ57; (m) CFG3, Grey ware, X41; (n) CFG5, Black Burnished ware, M3; (o) CFG5, Black Burnished ware, 4014. (Samples 186 from Chara 2 and 4014 from Soufli Magoula courtesy Prof. G. Schneider. All microphotographs under crossed polars).

Plate XII



Chapter 23, Figure 5. Microphotographs illustrating the main common fabric groups (CFGs) identified within the Thessalian ceramic assemblages: (a) CFG4, Black Burnished ware, TSAL11/22; (b) CFG4, Black Burnished ware, 1123; (c) CFG4, Black-on-Red ware, MV78; (d) CFG8, Bichrome and Polychrome ware, MV48; (e) CFG8, Bichrome and Polychrome ware, AGR11/14; (f) CFG8, Bichrome and Polychrome ware, TSP11/3; (g) organic material, MV56; (h) organic material, AGR11/16; (i) dung, KTM11/8; (j) dung, KTM11/22; (k) Almyros micro-network, Red-on-White ware, ATS140; (l) Almyros micro-network, Red-on-White ware, K11/13; (m) Almyros micro-network, Red-on-White ware, DA11/24; (n) pottery production in the area of Lake Karla, MV19; (o) pottery production in the area of Lake Karla, HM11/2. (Sample ATS140, a geological sample from the vicinity of Kamara, courtesy Colette Beestman. Microphotographs 7–10 in plane polarized light; all others under crossed polars).



INTERNATIONAL MONOGRAPHS
IN PREHISTORY

Archaeological Series 20

ISBN 9781879621473



9 781879 621473

90000 >

