University of Ljubljana, Faculty of Arts

Department of Archaeology

23rd Neolithic Seminar

From Chronos to Chronologies

Radiocarbon Dating and Chronological Modelling of the Neolithic and Chalcolithic Temporality in Eurasia

Programme

and

Abstract book

Friday 4th – Saturday 5th
November 2016

Programme

The conference will be held in the conference hall in the City Museum of Ljubljana

Friday, 4th November

Morning session 9.30–12.30 **Chair: Penny Bickle**

Introduction to the conference

Mihael Budja

Department of Archaeology, Faculty of Arts, University of Ljubljana, Slovenia

The comparison between the chronologies of Bronze cultures in Central Plain and at the border in China

Xiaohong Wu

School of Archaeology and Museology, Peking University, Beijing, China

The role of enhanced precipitation (seasonality and rainfall amount) for the domestication of animals and plants in the Near Eastern Early Neolithic

Bernhard Weninger

Institute of Prehistory, University of Köln, Germany

Tracing the spreading of neolithisation in the Aegean with radiocarbon dating

Yannis Maniatis[1], Kostas Kotsakis[2]

1 Laboratory of Archaeometry, Institute of Nanoscience and Nanotechnology, National Centre for Scientific Research "Demokritos", Attiki, Greece; 2 Department of Archaeology and History, Aristotle University of Thessaloniki, Greece

discussion & coffee/tea

Neolithic Thessaly: radiocarbon dated phases and subphases

Agathe Reingruber

Institute of Prehistoric Archaeology, Free University of Berlin, Germany

Modelling the earliest western spread of Mediterranean Impressed Wares: new dates and chronicles in the frame of the CIMO ANR Project

Didier Binder[1], Lucia Angeli[2], Louise Gomart[1], Jean Guilaine[3], Claire Manen[4], Roberto Maggi[5], Chiara Panelli[1,6], Giovanna Radi[2], Carlo Tozzi[2], Daniele Arroba[7],

***Janet Battentier*[1], *Laurent Bouby*[8], *Alain Carré*[1], *Claire Delhon*[1], *Lionel Gourichon*[1], *Renato Nisbet*[9], *Peter Rowley-Conwy*[10], *Stéphanie Thiébault*[11]**

1Cultures and Environments, Prehistory, Antiquity, Middle Ages, University of Côte d'Azur, CNRS, Nice Sophia Antipolis, France; 2The Department of Civilisations and Forms of Knowledge, University of Pisa, Italy; 3The Collège de France, Paris, France; 4The TRACES –Travaux de Recherches Archéologiques sur les Cultures, les Espaces et les Sociétés, CNRS, EHESS, MCC,University of Toulouse, France; 5The International Institute of Ligurian Studies, Chiavari, Italy; 6Department of Antiquities, Philosophy and History, University of Genova, Italy; 7Archaeological Museum del Finale, Finale Ligure, Italy; 8The Institute of Science of Evolution, CNRS, IRD, EPHE, University of Montpellier, France; 9Department of Asian and North African Studies, Ca' Foscari University of Venice, Italy; 10Department of Archaeology, Durham University, United Kingdom; 11National Museum of Natural History, CNRS, UMR 7209 AASPE, Paris, France

discussion & lunch break

Afternoon session 14.00–18.00 **Chair: Eszter Bánffy**

Modelling Mesolithic-Neolithic temporalities in the Danube Gorges

***Dušan Borić*[1], *Tom Higham*[2] *and Emanuela Cristiani*[3]**

1Department of Archaeology and Conservation, SHARE, Cardiff University, United Kingdom; 2Oxford Radiocarbon Accelerator Unit, Research Laboratory for Archaeology and History of Art Oxford, United Kingdom; 3Department of Archaeology, University of Cambridge, United Kingdom

Change the resolution, sharpen the story: dating the first thousand years of sedentism in western Hungary

***Krisztián Oross*[1], *János Jakucs*[1], *Anett Osztás*[1], *Tibor Marton*[1], *Derek Hamilton*[2], *Peter Marshall*[3], *Alex Bayliss*[4], *Eszter Bánffy*[5] *and Alasdair Whittle*[6]**

1Institute of Archaeology, Research Centre for The Humanities, Hungarian Academy of Sciences, Budapest, Hungary; 2SUERC, University of Glasgow, East Kilbride, United Kingdom; 3English Heritage, London, United Kingdom; 4Biological & Environmental Sciences, School of Natural Sciences, University of Stirling, United Kingdom; 5German Archaeological Institute, RGK, Frankfurt, Germany; 6School of History, Archaeology and Religion, Cardiff University, United Kingdom

Return to the underworld: differences in habitation structures in Lasinja and Retz-Gajary cultures

Mateja Hulina, Hrvoje Kalafatić

Institute of Archaeology, Zagreb, Croatia

discussion & coffee/tea

Time frames of cultural processes in Neolithic of northwestern Russia in the 7th–3rd millennium BC

Andrey Mazurkevich [1], Ganna Zaitceva [2], Marianna Kulkova [3] and Katerina Dolbunova [1]

1The State Hermitage Museum, Department of Archaeology of Eastern Europe and Siberia, Saint Petersburg, Russia; 2Institute for the History of Material Culture, Russian Academy of Sciences, Saint Petersburg, Russia; 3Herzen State Pedagogical University, Saint Petersburg, Russia

Radiocarbon chronology of the neolithisation in the Volga and Don river basin of Eastern Europe

Alexander A. Vybornov [1], Marianna A. Kulkova [2]

1Samara State Academy of Social Sciences and Humanities, Samara, Russia; 2Herzen State Pedagogical University, Saint Petersburg, Russia

discussion & conference dinner

Saturday, 5th November

Morning session 9.00–15.00 **Chair: Bernhard Weninger**

The Vinča potscape

Alasdair Whittle [1], Alex Bayliss [2], Alistair Barclay [3], Bisserka Gaydarska [4], Eszter Bánffy [5], Dušan Borić [1], Florin Draşovean [6], János Jakucs [7], Miroslav Marić [8], David Orton [9], Ivana Pantović [10], Nenad Tasić [11], Wolfram Schier [12] and Marc Vander Linden [13]

1School of History, Archaeology and Religion, Cardiff University, United Kingdom; 2Biological & Environmental Sciences, School of Natural Sciences, University of Stirling, United Kingdom; 3Wessex Archaeology, Salisbury, United Kingdom; 4Department of Archaeology, Durham University, United Kingdom; 5German Archaeological Institute, RGK, Frankfurt, Germany; 6Institute for Doctoral Studies University of Babeş-Bolyai, Cluj-Napoca, Romania; 7Institute of Archaeology, Research Centre for The Humanities, Hungarian Academy of Sciences, Budapest, Hungary; 8Institute for Balkan Studies, Serbian Academy of Sciences and Arts, Beograd, Serbia; 9Department of Archaeology University of York, United Kingdom; 10City Museum Vršac, Serbia; 11Department of Archaeology, University of Beograd, Serbia; 12 Institute of Prehistoric Archaeology, Free University of Berlin, Germany; 13Institute of Archaeology, University College London, United Kingdom

Zooming into the biography of tell. High definition chronology and social dynamics at Uivar, Romania 5200–4300 calBC

***Wolfram Schier*[1], *Florin Drasovean*[2], *Alex Bayliss*[3] *and Alasdair Whittle*[4]**

1Institute of Prehistoric Archaeology, Free University of Berlin, Germany; 2Institute for Doctoral Studies University of Babeş-Bolyai, Cluj-Napoca, Romania; 4Biological & Environmental Sciences, School of Natural Sciences, University of Stirling, United Kingdom; 5School of History, Archaeology and Religion, Cardiff University, United Kingdom

Dating proto-urban sprawl: adapting the Bayesian approach to archaeological chronology to the study of Trypillia mega-sites

***John Meadows*[1,2], *Robert Hofmann*[3] *and René Ohlrau*[4]**

1Centre for Baltic and Scandinavian Archaeology, Schloss Gottorf, Schleswig, Germany; 2Christian-Albrechts-University, Leibniz-Laboratory for AMS Dating and Stable Isotope Research, Kiel, Germany; 3Christian-Albrechts-University, Institute for Pre- and Protohistory, Kiel, Germany; 4Christian-Albrechts-University, Graduate School Human Development in Landscapes, Kiel, Germany

Chronology and development of the Chalcolithic necropolis of Varna

***Raiko Krauß*[1], *Bernhard Weninger*[2]**

1Institute of Prehistory, Early History and Medieval Archaeology Univesity of Eberhard Karls, Tübingen, Germany; 2Institute of Prehistory, University of Köln, Germany

discussion & coffee/tea

Do ^{14}C dates always turn into an absolute chronology? The case of the Middle Neolithic in western Lesser Poland

Marek Nowak

Institute of Archaeology, Jagiellonian University, Kraków, Poland

What this scale means: implications of new chronologies for the 6th and 5th millennium calBC in Central Europe

***Penny Bickle*[1], *Seren Griffiths*[2]**

1Department of Archaeology, University of York, United Kingdomč 2School of Forensic and Investigative Sciences, University of Central Lancashire, Preston, United Kingdom

Discrepancies between archaeological and ^{14}C-based chronologies: problems and possible solutions

Hans-Christoph Strien

Institute of Prehistory and Early History, University of Johannes Gutenberg, Mainz, Germany

general discussion & closing remarks

Notes

Abstract book

The comparison between the chronologies of Bronze Age cultures in the Central Plain and on the border in China

Xiaohong Wu

The Chinese state civilization started in the Central Plain with the impact of bronze technology. It is obvious that the utilization of bronze is not an indigenous invention in the Central Plain. It might come from other areas, for example, west Asia along the Hexi corridor or from the Eurasia steppe. But archaeometallurgical researches show that the traditions for making bronze artefacts in the Central Plain are different from those in the steppe area or in the Hexi corridor. In order to understand the route and mechanism of the cultural interaction and exchanges related with bronze technology, we have to establish an accurate chronology of Bronze Age cultures in different regions in China and carry out a comparative study on the intercultural basis.

The role of enhanced precipitation (seasonality and rainfall amount) for the domestication of animals and plants in the Near Eastern Early Neolithic

Bernhard Weninger

The aim of this paper is to provide a comprehensive climate-archaeological platform for precipitation-related Early Neolithic archaeological, archaeozoological, and archaeobotanical studies in the Near East. To begin, a review of Near Eastern and Southern European (cold-climate) archaeology is given for two topics: (1) climate-related end of the Neolithic in S Levant (Jordanian rubble slides), and (2) climate-delayed departure of the Early Neolithic out of the Aegean into the Pannonian Basin. These two studies conform to the widespread yet curiously one-sided view that 'climate change' is something naturally 'bad' (in the sense of hazardous).

The main focus of the present paper is on 'good-climate', *i.e.* the assumption (yet to be tested) that the otherwise well-established moist conditions during the Early Holocene in the Near East are likely to be positively correlated, for example, with vegetation growth, fertility, and birth rates, population sizes, and last but not least with an accelerated molecular evolution of plant and animal DNA.

In addressing our basic hypothesis that water availability will have generally positive effects on Early Holocene societal development, we first provide a supra-regional com-

Notes

parison of selected climate records (when possible: high-precision and high-temporal density) from South-West Asia. Already previously established (by many authors, for different regions), these records provide evidence for the existence of a distinct moist period in the Near East, that begins quite abruptly at around 10.2 ka calBP and a rather unclear end around 6 ka calBP. Further, the widespread geographical occurrence of this moist period not only within the eastern Mediterranean (with 'winter rain', under North Atlantic influence via the Westerlies) but also in regions far to the east that are under monsoon influence (*i.e.* 'summer rain' in India, China) is interesting. Focussing for the moment on the eastern Mediterranean, what we further observe is that the abrupt rise in precipitation at around 10.2 ka calBP is evidenced, strongly, both in the terrestrial and the marine regimes. The Early Neolithic moist period is presently the best-exemplified, and best-dated, in the widespread formation of Sapropel S1 at 10.2 ± 0.26 ka calBP in the various sub-basins of the eastern Mediterranean (eMed: Levantine Sea, Aegean Sea, Adriatic). The onset of S1 occurs synchronously in these regions, both in the bathyal and abyssal basin areas. Curiously, and what complicates matters, the moist period is difficult to recognise in available stalagmite-records, *e.g.*, from the Levant. It shows up well in terrestrial dust records from NE Iran.

In archaeological terminology, the beginning of the moist period at 10.2 ± 0.26 ka calBP would be equivalent to the late PPNA and early PPNB. According to archaeozoological and archaeobotanical evidence, around the same time many of the decisive steps in plant and animal domestication were taken. Remaining key problems, as addressed by respective specialists, include: (1) the timing and speed of development of the domestication traits (*e.g.*, animal body size, plant morphology), and (2), quantification of contributions to the domestication process by different factors (*e.g.*, biological, social and climatic, and/or factor combinations).

With the present studies we hope to contribute towards long-standing discussions of the following questions: (A) Are the observed Early Neolithic plant and animal domestication processes rather too judged as 'slow' (centennial-millennial scale), or alternatively as 'fast' (decadel-centennial)? (B) To what extent do the domestication processes run parallel to the Early Neolithic moist period?; and finally the main question: (C) To what extent are the domestication processes causally related to the moist period, *i.e.* does 'climate change' play an important role during plant/animal domestication, or not?

Notes

Tracing the spreading of neolithisation in the Aegean with radiocarbon dating

Yannis Maniatis, Kostas Kotsakis

The appearance of farming and stockbreeding is considered as a crowning event in human evolution and history and is quite rightly sometimes called the 'Neolithic Revolution'. Concerning Greece, the issue of its appearance has a special significance not only because it completes an important early chapter of the history but because it is also related to the spread through Greece of the farming-stockbreeding mode in Europe.
The time and pattern by which the 'Neolithic Revolution' appeared and spread in the Aegean after its first appearance in the Levant has been the focus of our research in the recent years. Previous studies have suggested that the Neolithic phase has moved progressively in time by migration of people from NW Turkey to Greece, either via the Bosporus canal to Thrace and then to Greece, the Balkans, and Europe, or through the sea from the west coast of Turkey, crossing the Aegean to Thessaly and then to North Greece, the Balkans, and Europe.
We have performed a long series of radiocarbon dating from early Neolithic sites in North Greece showing that the earliest human settlements in west Macedonia Greece and especially around the Yannitsa plain (then filled with sea extending the Thermaic Gulf inland) were established around 6650 BC. This is about 100 years earlier than in NW Turkey (6500/6400 BC) and closely contemporaneous with the West coast of Turkey, which is now placed around 6680 BC. New series of radiocarbon dates have been added recently which complete the evidence by enriching the stratigraphic sequences of the earliest settlements in West Macedonia and also by extending it to other settlements in Macedonia, North West Greece, Thessaly, and Albania.
Based on this accumulated evidence now, we propose a maritime model for the spreading of neolithisation in the Aegean from the Levant and Southeast Anatolia up along the Aegean Sea. This migration probably occurred in two or more waves separated by 200 years.
Acknowledgements: This research has been supported by the Institute for the Aegean Prehistory (INSTAP).

Notes

Neolithic Thessaly: radiocarbon dated phases and subphases

Agathe Reingruber

The beginning of the Neolithic way of life in the Aegean can reliably be dated to *c*. 6700/6600 calBC. The first phase of the Neolithic, the Early Neolithic (EN), has been thought to end around 5800 BC, on behalf of the dates from Nea Nikomedeia (Macedonia). A new modelling of old sequences from Thessaly itself has shown that the transition towards the Middle Neolithic (MN) should have occurred around 6000 calBC, the Late Neolithic (LN) starting already at 5500 calBC and not at 5300 calBC. Yet, the internal distinction of phases, especially of the subphases EN I-III, are far from being clarified. With this contribution a proposal will be forwarded that discusses a more precise duration of single phases.

Modelling the earliest western spread of Mediterranean Impressed Wares: new dates and chronicles in the frame of the CIMO ANR Project

Didier Binder, Lucia Angeli, Louise Gomart, Jean Guilaine, Claire Manen, Roberto Maggi, Chiara Panelli, Giovanna Radi, Carlo Tozzi, Daniele Arroba, Janet Battentier, Laurent Bouby, Alain Carré, Claire Delhon, Lionel Gourichon, Renato Nisbet, Peter Rowley-Conwy, Stéphanie Thiébault

The authors try to specify the diffusion pattern of the Impressed-Ware Neolithic (Impresso-cardial complex), from Southeastern Italy onto the French Mediterranean coasts. A Bayesian modelling, run thanks to ©ChronoModel software, is built with sets of dates obtained exclusively on short-life samples, accurately contextualized. Our results suggest; (i) a clear tightening of the chronology in the so called nuclear area (Puglia, Basilicate, Calabria), and (ii) a pioneer spread at a record speed on the Tyrrhenian slope. In addition, they lead to reconsideration of the assumption of a common origin of both routes, Adriatic and Tyrrhenian, as well as related communities.

Modelling Mesolithic-Neolithic temporalities in the Danube Gorges

Dušan Borić, Tom Higham and Emanuela Cristiani

The area of the Danube Gorges in the central Balkans is well known for its long sequences and continuities between forager/Mesolithic and first agriculturalist/Neolithic occupations. Over the past twenty years, a number of research projects have yielded a fairly large pool of radiocarbon measurements (300 in total) available from this regional context, and these provide an opportunity for constructing fine-tuned chronological

Notes

frameworks at both site-level and regional scales. The paper evaluates the current quality of radiocarbon dating evidence from this regional context, highlights problems with certain measurements, and provides chronological models for individual sites employing formal Bayesian statistics. These site-based estimates are further compared to regional and supra-regional chronological scales and the timing of climatic events, such as the 8.2 ka cal BP event. In the end, we evaluate and compare inferences gained through formal Bayesian statistical modelling, on the on hand, and summed probability plots of radiocarbon dates as 'data', on the other, to understand both the scale of individual and generational life histories and population demographics over the long term.

Change the resolution, sharpen the story: dating the first thousand years of sedentism in western Hungary

Krisztián Oross, János Jakucs, Anett Osztás, Tibor Marton, Derek Hamilton, Peter Marshall, Alex Bayliss, Eszter Bánffy and Alasdair Whittle

Neolithic researchers in Transdanubia (western Hungary) have worked for decades with single radiocarbon dates and with informal analysis of small series of calibrated dates. Recent dating programmes, as parts of the ERC-funded 'The Times of Their Lives' project (www.totl.eu) and other projects with the collaboration of the Institute of Archaeology, RCH, Hungarian Academy of Sciences, have targeted the formal Bayesian chronological modelling of Neolithic sites in southern Transdanubia. This paper presents the results from several different sites, belonging to different archaeological cultures, which appeared through the course of the 6th millennium calBC, in the transitional area between the Balkans and Central Europe. We discuss the implications of a substantially amended chronology for the reconstruction of site formation processes, cultural development and social relationships – both on a regional scale and beyond.

Return to the underworld: differences in habitation structures in Lasinja and Retz-Gajary cultures

Mateja Hulina, Hrvoje Kalafatić

One of the most important things when dealing with prehistoric societies are their buildings and places where they led their daily lives. Those types of buildings changed through time, with different archaeological cultures. Changes are sometimes subtle and sometimes obvious. Such is the study we are going to present.
We will use three Eneolithic settlements from Eastern Croatia, Čepinski Martinci, Ivandvor, and Čeminac, to trace changes in the spatial-temporal frame (chronotope). The

Notes

first is a settlement of Lasinja culture with above-ground, rectangular houses. At the same site, there is also a post Lasinja Furchenstich horizon with unconfirmed types of houses. Ivandvor and Čeminac are settlements of the late Retz Gajary culture where people were living in large pit-dwellings. We will follow traces of change through time, supported by radiocarbon dates, from above-ground houses in the Lasinja culture back to pit-dwellings in the Retz Gajary culture that go against 'standard' linear development (from cave to skyscraper).

Time frames of cultural processes in Neolithic of northwestern Russia in the 7th–3rd millennium BC

Andrey Mazurkevich, Ganna Zaitceva, Marianna Kulkova and Katerina Dolbunova

Since the 1960s, more than 250 radiocarbon dates were obtained from materials attributed to the Neolithic in the Upper Dvina area that cover a timeframe from the 7th to the 3rd millennium BC. ^{14}C dates, from materials of the Dnepr-Dvina area, reflect the time of appearance and decline of various cultural traditions – from the formation of the oldest pottery among hunter-gatherers communities till the appearance of the first stock-breeders in the forest zone – bearers of cultural traditions of the Corded Ware pottery. Numerous hiatuses could be revealed by analysing the ^{14}C dates. Could these hiatuses be traced also in the materials or do they appear because of lack of data that exists nowadays? It is important to note that these hiatuses coincide with significant climatic and environmental changes – could it mean that they were determined by these processes and changes occurred in ecological niches? On the other side, dates made for materials of the Upper Dvina area show both the existence of time hiatuses between some cultural-chronological groups, and quasi (?) co-existence of some of the groups. It also comes from the perception of the time, as real time always differs from the time revealed with ^{14}C dates.

Radiocarbon chronology of the neolithisation in the Volga and Don River basin of Eastern Europe

Alexander A. Vybornov, Marianna A. Kulkova

The beginning of the Neolithic period in the southern regions of the Russian Plain is still under study. In contrast to Western Europe where the process of neolithisation is considered as the development of farming and domestication, in Eastern Europe the appearance of early pottery is an indicator of this process. The chronology of Neolithic sites in the steppes and forest steppes of the Volga and Don River basins is reconstructed

Notes

on the base of radiocarbon dates of different organic materials (bones, charcoal, food crusts on ceramics) from cultural layers.
But in the steppe and forest-steppe zones organic materials were poorly preserved in the Neolithic cultural layers. The most abundant artefacts are fragments of pottery. The radiocarbon dates of organic materials from pottery were used also. These dates were compared with dates that we obtained from other types of organic materials. In the southern part of the region the beginning of the Neolithic was dated to *c.* 5700–5200 calBC. In the northern part of the forest-steppe zone, the populations with the first pottery have appeared in the period from 5500 to 5200 calBC. The cultures of Central Asia influenced the process of neolithisation in this region. In the Volga and Kama forest zone the first pottery occurred about 800-1000 years later than in the southern regions.

The Vinča potscape

Alasdair Whittle, Alex Bayliss, Alistair Barclay, Bisserka Gaydarska, Eszter Bánffy, Dušan Borić, Florin Drașovean, János Jakucs, Miroslav Marić, David Orton, Ivana Pantović, Nenad Tasić, Wolfram Schier and Marc Vander Linden

Recent work at Vinča-Belo Brdo has combined a total of more than 200 radiocarbon dates with an array of other information to construct much more precise narratives for the structural history of the site and the cultural materials recovered from it (*Tasić* et al. *2015; 2016a–b*). In this paper, we present the results of a recent attempt to construct formal models for the chronology of the wider Vinča potscape, so that we can place our now detailed understanding of changes at Belo Brdo within their contemporary contexts. First, we present our methodology for assessing the potential of the existing corpus of more than 600 radiocarbon dates for refining the chronology of the six phases of Vinča ceramics proposed by Milojčić (*1949*) across their spatial ranges. Then we outline our main results for the development of Vinča pottery. Finally, we discuss some of the major implications for our understanding of the source, character and tempo of material change. This work is an outcome of the ERC-funded project, 'The Times of Their Lives' (www.totl.eu), which is using a Bayesian approach to the interpretation of radiocarbon dates to refine our understanding of a wide range of issues across the European Neolithic.

References

Milojčić V. 1949. Chronologie der jüngeren Steinzeit Mittel- und Südosteuropas. Gebr Mann. Berlin.

Tasić N., Marić M., Penezić K., Filipović D., Borojević K., Borić D., Cook G., Reimer P., Bayliss A., Barclay A., Gaydarska B. and Whittle A. 2015. The end of the affair: formal chronological modelling for the top of the Neolithic tell of Vinča-Belo Brdo. *Antiquity 89: 1064–1082*.

Notes

Tasić N., Marić M., Filipović D., Penezić K., Dunbar E., Reimer P., Barclay A., Bayliss A., Gaydarska B. and Whittle A. 2016a. Interwoven strategies for refining the chronology of the Neolithic tell of Vinča-Belo Brdo, Serbia. *Radiocarbon 58(4)*.
Tasić N., Marić M., Beavan N., Bronk Ramsey C., Kromer B., Barclay A., Bayliss A., Gaydarska B. and Whittle A. 2016b. Vinča-Belo Brdo, Serbia: the times of a tell. *Germania 93: 89–157*.

Zooming into the biography of tell. High definition chronology and social dynamics at Uivar, Romania 5200–4300 calBC

Wolfram Schier, Florin Drasovean, Alex Bayliss and Alasdair Whittle

A joint Romanian-German team has performed excavations and interdisciplinary research at the Late Neolithic tell site 'Gomila' near Uivar, Romanian Banat, in the years 1998–2009. During 10 field campaigns a stratigraphic sequence of 11 Neolithic building stages has been established. 2013–2015 we were able to cooperate with the British ERC project 'Times of Their Lives' (ToTL), led by Alasdair Whittle (Cardiff). In the course of this cooperation, a complex Bayesian model of the Uivar stratigraphic sequence was achieved, based on a total of 180 radiocarbon dates. This contribution will present the chronological resolution achieved by this approach and discuss the consequences for house duration, the relations between settlement and surrounding ditch system, as well as the changes in cultural attribution of the site. The enhanced chronology challenges some former hypotheses within the Uivar project and gives new insights into the social dynamics of its inhabitants.

Dating proto-urban sprawl: adapting the Bayesian approach to archaeological chronology to the study of Trypillia mega-sites

John Meadows, Robert Hofmann and René Ohlrau

Bayesian chronological modelling has long been used to interpret radiocarbon results from small, single-phase settlements, and more recently has been applied to studies of much larger sites with deep stratigraphic sequences, with impressive results (*e.g.*, *Bayliss* et al. *2015; Tasić* et al. *2016*). In combination with typological sequences, this approach also has the potential to reveal intra-site chronological patterns at long-lived 'flat' sites (*e.g.*, *Czerniak* et al. *2016*). The 4th millennium calBC Trypillia mega-sites in western Ukraine present a different set of taphonomic and stratigraphic issues, and different sampling constraints and opportunities, which require us to check whether the modelling tools used in earlier applications are adequate and appropriate for the specific questions we wish to address. These include the use-life of particular buildings, the chronology of internal development of mega-sites, and the chronological relationships between settlements. Unless we can answer these questions, we cannot investi-

Notes

gate one of the main underlying problems in Trypillia research, the demographic dimension, which can be approximated by the number of houses occupied simultaneously (*Müller* et al. *2016*).
This presentation will use the preliminary results available from three nearby mega-sites, Dobrovody, Talyanki, and Maidanetske, to inform simulation models that incorporate results of new fieldwork, and which we are using to select new radiocarbon samples for AMS dating, within the new Collaborative Research Centre SFB1266, 'Scales of Transformation: Human-Environmental Interaction in Prehistoric and Archaic Societies'. Our aim in this presentation is to discuss the particular challenges of dating Trypillia mega-sites, and how we need to adjust our models to realistically assess which of the research questions can be answered and which are likely to remain elusive.

References

Bayliss A., Brock F., Farid S., Hodder I., Southon J. and Taylor R. E. 2015. Getting to the bottom of it all: a Bayesian approach to dating the start of Çatalhöyük. *Journal of World Prehistory 28(1): 1–26*.
Czerniak L., Marciniak A., Bronk Ramsey C., Dunbar E., Goslar T., Barclay A., Bayliss A. and Whittle A. 2016. House time: Neolithic settlement development at Racot during the 5th millennium calBC in the Polish lowlands. *Journal of Field Archaeology 41(5): 618– 640*.
Müller J., Hofmann R., Brandtstätter L. and Ohlrau R. 2016. Chronology and demography: how many people lived in a mega-site? In J. Müller, K. Rassmann and M. Videikho (eds.), *Trypillia Mega-Sites and European Prehistory: 4100–3400 BCE*. Routledge. London and New York: 133–170.
Tasić N., Marić M., Filipović D., Penezić K., Dunbar E., Reimer P., Barclay A., Bayliss A., Gaydarska B. and Whittle A. 2016. Interwoven strands for refining the chronology of the Neolithic tell of Vinča-Belo Brdo, Serbia. *Radiocarbon*. DOI: 10.1017/RDC.2016.56.

Chronology and development of the Chalcolithic necropolis of Varna

Raiko Krauß, Bernhard Weninger

In this contribution the results of Gaussian Monte Carlo Wiggle Matching (GMCWM) of a large set seriated ^{14}C dates from the Chalkolithic Necropolis of Varna (Bulgarian Black Sea coast) will be presented. The new chronological results are based on a variety of statistical studies towards the development of the burial ground that includes, *e.g.*, demographic age analysis, internal social structure and gender differentiation. The chronological results are based on large-scale Correspondence Analyse (CA) from which it was possible to derive a sequence of the graves, and their inventories, at high temporal resolution. Now, for the first time, the available large set of ^{14}C dates can be modelled according to the actual grave sequence.
What is interesting from a methodological view-point, and what is indeed highly disturbing, is that the results achieved by independently by GMCWM and by Bayesian Se-

Notes

quencing show major dating discrepancies. What we observe, in particular, is that previous applications of Bayesian Sequencing have inadvertently led to a nearly complete time-reversal of the cemetery development. This is notable for the burials with large gold inventories. Finally, from selected complexes we have collected new archaeological and ^{14}C radiometric data that provide further insights as to the dating of the very end of this exceptional burial and ritual place.

Do ^{14}C dates always turn into an absolute chronology? The case of the Middle Neolithic in western Lesser Poland

Marek Nowak

In the late fifth, fourth and early third millennia BC different archaeological phenomena are visible in western Lesser Poland. According to traditional views, local branches of the late Lengyel-Polgár complex, the Funnel Beaker culture, and the Baden culture overlap chronologically in great measure. The presentation will examine the question whether new data referring to their absolute chronology corroborate such views.
Results of investigations give rise to the two basic interpretations. Firstly, we can accept the holistically modelled time ranges, without paying attention to their diversity in terms of probability. Secondly, we can take into account only those segments of time intervals which are characterized by the highest probability. Statistical analyses and contextual interpretations of these data suggest that most of these archaeological phenomena would indeed be limited only to 'hard cores' but some would not. Consequently, a discrete way and linearity of cultural transformation should be recommended, but in some cases a continuous and partly simultaneous development should be proposed. The study demonstrates that extreme approaches, in which we either approve only those dates which fit into our concepts or accept without any reservations all dates as such, are incorrect.

What this scale means: implications of new chronologies for the 6th and 5th millennium calBC in Central Europe

Penny Bickle, Seren Griffiths

Multiple approaches to refining radiocarbon chronologies have challenged perceptions of continuity across the Neolithic of central Europe. In place of steady and gradual change, in which one culture is replaced by the next in neat and unbroken succession, a far more regional picture is developing. In some areas 'boom and busts' have been hypothesised, with a population collapse suggested after the initial flourishing of farming. These new chronologies have significant implications for how archaeology thinks about social

Notes

change. This paper will address the new chronologies for the end of the Linearbandkeramik (LBK, *c.*5500–5000 calBC) and the start of the post-LBK, after 5000 calBC.

Discrepancies between archaeological and ^{14}C-based chronologies: problems and possible solutions

Hans-Christoph Strien

In the last two decades in central European Neolithic archaeology, there was a strong tendency towards ^{14}C as a major source for the construction of chronological models. The results are in some crucial points quite different from what typo-chronological approaches suggest. It will be demonstrated that at least part of these differences are the result of underestimated problems in ^{14}C dating of bone collagen. Also, knowing the taphonomic problems with charcoal and even more with cereal grains, we have to admit that chronological modelling of central European Early/Middle Neolithic (5600–4300 calBC) based upon ^{14}C dates exclusively is highly problematic at the present state of research.

23rd Neolithic Seminar

Department of Archaeology

Faculty of Arts, University of Ljubljana