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Sławomir Kadrow*

About the Chronology of the Beginning of the Metal Ages

ABSTRACT

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This article discusses the cases of the Bayesian analysis of series of AMS radiocarbon indications that modify our knowledge of the relative and absolute chronology of the Copper Age in the Great Hungarian Plain and the beginning of the Bronze Age in southern Germany and Central Europe. The results of relevant analyses have been reported as well as their importance for better understanding of the determinants of chronological and periodization patterns has been commented.

Keywords: Copper Age, Great Hungarian Plain, Early Bronze Age, Southern Germany, Bayesian analysis AMS, chronology

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Time is the dimension of reality, which in the light of Einstein's theory of relativity is continuous. Many philosophers emphasize the randomness and an arbitrary character of history (see Pare 2008, 70). Archaeology, as part of the science that is embedded in culture, has the purpose of taming the random outer nature and the accidental elapse of time. A man gives meaning to the lived world. He refers it to the myth, *i.e.*, to the reality which does not need any justification or proof. Culture (including archaeology) gives meaning to reality (Kołakowski 2009, 13–15). One of the many ways of taming reality and giving meaning to it is a set of all sorts of classifications, including the typology and periodization of the analysed pieces of history (see Kadrow 2016, 13–15). Unclear, continuous time divided into pieces (epochs, periods, phases) becomes meaningful and sensible (Kadrow 2013, 782).

In every society, the perception and measurement of time are related to socio-cultural behaviours and to the structure of particular groups (*e.g.* Kadrow 2013). In western civilization we are dealing with a unification of meaning and measuring of time with regard to the applied rules in rationalized society (Aveni 2001, 10–16).

* Institute of Archaeology and Ethnology, Polish Academy of Sciences, Sławkowska St. 17, 31-016 Kraków, Poland; slawekkadrow@gmail.com

The origins of this process took place in the Enlightenment. Its testimony is the elaboration of scientific principles of typology as a way of determining relative chronology by Johann Joachim Winckelmann in his work *Geschichte der Kunst des Alterthums* in 1764 (see Schnapp, Kristiansen 1999) and the three-age system by Christian Jürgensen Thomsen in the exhibition catalogue in Copenhagen Museum titled *Ledetraad til nordisk Oldkyndighed* in 1836. This last work owed much to the achievements of the Danish Enlightenment historian Peter Frederik Suhm, who worked in the second half of the 18th century (see Pare 2008, 71).

Until now, the efforts aimed at establishing chronology and periodization in archaeology have been inspired mainly by the work of Oscar Montelius (1885), considered to be one of the most accomplished achievements in this field (Gräslund 1986). Polish research literature presents in details the rules governing the basis of relative chronology (see *e.g.* Dąbrowski 1993) as well as the criticism of principles concentrating only on studies of this type (Ostoja-Zagórski 1989). This frees me from the obligation to address these issues in this article. It was taken for granted that similar (identical) artefacts were manufactured, used and deposited at roughly the same time. Possible differences in the time of production and circulation of the mentioned items could be due to spatial distance, the effect of regionalization. Other reasons for "behaving" artefacts in time have not been recognized.

In the 1950s, the internal chronology of the Copper Age in the Great Hungarian Plain was established, *i.e.* the periods of the Tiszapolgár (Early), Bodrogkeresztúr and Hunyadihalom (Middle Period) and Baden (Late Copper Age) cultures. This scheme was developed on the basis of the research results carried out at the Tiszapolgár-Basatanya cemetery (Bognár-Kutzián 1963) and the stratigraphy at the Székely-Zöldtelek settlement (Kalicz 1958). Evžen Neustupný defined the absolute chronology of the Tiszapolgár culture for the period between 4500 and 4000 BC and the Bodrogkeresztúr culture for the period 4000–3600 BC (Neustupný 1968, tab. 5).

The Tiszapolgár and Bodrogkeresztúr cultures were considered to be the successive stages of the development of the Copper Age in the Tisza River basin. This is confirmed by the correspondence analysis of the pottery types deposited in graves in Basatanya cemetery (Meisenheimer 1989). Nevertheless, it must be remembered that Ida

Bognár-Kutzián distinguished a category of so-called transitional graves in this cemetery (Bognár-Kutzián 1963, 538). She noted at the same time, that these graves are not archaeological evidence of the transformation of the Tiszapolgár's culture unit to the Bodrogkeresztúr one (Bognár-Kutzián 1963, 523), suggesting that the latter culture is not genetically the successor of the first one as well as there was such a short period in the history of functioning of the cemetery in Basatanya, where the communities of both cultures used it together.

In the studies on the Early Bronze Age in Central Europe, there are some difficulties in synchronizing the results of chronological studies on various categories of artefacts (Kadrow 2001, 39). The multiphase internal chronology of the Únětice culture is based on the typology of ceramic vessels (Moucha 1963). Furthermore, the temporal relationship of "classical", well-profiled pottery with the "classical" bronze articles is also suggested, mainly with the pins with an eyelet (*e.g.* Bartelheim 1998, 9–12). However, the extent of the classical forms of the two categories of artefacts coincide only in Central Germany, Bohemia , Moravia and Silesia as well as in the south-western Greater Poland (see Kadrow 2001, Figure 5). In Mecklenburg (*e.g.* Melz – see Rassmann, Schoknecht 1998) or in the northern Greater Poland (*e.g.* Gedl 1983, Table 52A, B, D) there are classical metal items, but there is no trace of classical, well-profiled ceramics. On the other hand, in the south-western Slovakia, pre-classical pottery (from the II and III phases of the Mouchy) is sometimes found together with the Únětice pins (*e.g.* in Vel'ky Grob, see Novotná 1980, 12).

Interpretative problems also arise in the field of radiocarbon dating of some uncovered sets. Considering grave 24 at Quenstedt, which contains a well-profiled cup and grave 34, coming from the same cemetery, where a pin with an eyelet (Únětice – style head) was discovered, their dates were established to the periods 2350–2120 and 2300–2030 BC respectively (Müller 1999, fig. 3). This chronology falls definitely into earlier period than expected.

Johannes Müller reminded that more than 60 years ago, some German researchers had noticed that what was considered to be a time sequence (rounded cups were followed by well-profiled cups), it might have had the dimension of a spatial variation (two regional groups with rounded and well-profiled cups, see Mandera 1953, 178–192). Ulrich Fischer suggested that the spatial aspect is also visible in the presence

of graves equipped mainly with ceramics and graves with mainly metal inclusions (Fischer 1956).

It is worth mentioning that, contrary to prevailing views, the Proto-Únětice and the Old Únětice phases were sometimes considered to be contemporary, genetically different cultural phenomena occurring in the same areas next to each other rather than the subsequent phases of the same culture (Pleinerová 1966, 1967).

On the basis of radiocarbon dates, horizontal stratigraphic and typological analyses of the settlement assemblages of the classic phase of the Mierzanowic culture at the site Babia Góra I-II in Iwanowice, the co-occurrence of several pottery stylistics (3b and 3c as well as 3d and 3e) were observed within the area of one settlement (Kadrow 1991, 55–57, fig. 32).

Müller suggests recognizing the above described state as the effect of the existence of two territorial groups: (a) central one with classic cups and with classic metal objects, and (b) peripheral one with cups with rounded bodies and in practice without metal items in graves. The first group he connects with the centres of power and the arising elites, and the latter one with the egalitarian populations of the Únětice culture (Müller 1999, 118–123).

Over the last few years, two important articles have been published (Raczky, Siklósi 2013, Stockhammer *et al*. 2015), whose content convinces us to change our approach to the typology and problems of relative chronology, not only in the case of the Carpathian Basin in the Copper Age and Central Europe in the Early Bronze Age.

Regarding the first article (Raczky, Siklósi 2013), the authors proposed a revision of the chronology of the early and middle periods of the Copper Age in the Great Hungarian Plain. They took a series of charcoal and bone samples to determine the absolute dating by means of AMS radiocarbon method. Samples (35 pieces) were taken from four cemeteries, one settlement surrounded by ditches and one open settlement (see Raczky, Siklósi 2013, table 1, fig. 1). They come from well-defined contexts and contain rich material remains, which allow us to determine them unambiguously and attribute them to a specific typological-cultural taxon. Then all radiocarbon indications were subjected to Bayesian analysis. The most convincing data set was obtained from the Tiszapolgár-Basatanya cemetery (Raczky, Siklósi 2013, fig. 2–5).

In the light of new analyses, there is a contradiction between the cultural sequence within the area of the Great Hungarian Plain, based on traditional methods and radiocarbon dating. ASM measurements suggest that the beginning of the Copper Age (Eneolith) began there around 4350 BC and it continued until about 4000 BC (Raczky, Siklósi 2013, table 2, fig. 7). Different variants of the Tiszapolgár style were present throughout this period, while the Bodrogkeresztúr style, which should have supposedly replaced the former one, was also recorded in the oldest graves of the discussed period. At Basatanya cemetery graves containing the Bodrogkeresztúr pottery appeared already around 4300 BC and they were occurring continuously until 4000 BC. This phenomenon proves that both styles were together at that time at the discussed cemetery. The thesis about chronological sequences of both ceramic styles should be replaced by another interpretation.

The AMS dates, coming from other cultural sites of the Tiszapolgár and Bodrogkeresztúr cultures in the northern and central parts of the Great Hungarian Plain confirm the synchronicity of both ceramic styles. It might be explained only partially as the effect of disturbances in the course of the calibration curve. The stated synchronicity of both pottery styles should lead to rethinking of the prevailing views on their role as chronological determinants of the subsequent phases of the Copper Age in the eastern part of the Carpathian Basin. However, it points to the socio-cultural implications of the situation in this part of our continent. It also plays an important role (see Raczky, Siklósi 2013, fig. 7) in changing our views on the much earlier chronology of the appearance of massive copper products as well as gold (grave F201 / S328 in Rákóczifalva-Bagi-fóld) and silver ornaments (grave 2 in Tishalúc-Sarark) within the discussed area.

New results of dating regarding the Middle Copper Age in Transdanubia show by the use of the high-precision AMS indications that the cultural relations found in the Tisza basin had a broader spatial dimension.

It is worth mentioning that a year later another article, devoted to issues of relative and absolute chronology of the Copper Age in the Great Hungarian Plain was published (Brummack, Diaconescu 2014), which in a completely different light presents these problems. According to the authors, the Bayesian analysis of numerous AMS dates confirms a traditional, inner developmental sequence of the

Tiszapolgár, Bodrogkeresztúr and Hunyadihalom cultures (Brummack, Diaconescu 2014, fig. 4–9). The basis of an a priori assumption of the Bayesian interpretation of radiocarbon determinations in this article were the premises in the field of vertical stratigraphy in Székely-Zöldtelek (Kalich 1958, 2–6, Brummack, Diaconescu 2014, fig. 1) and the correspondence analysis of pottery types in Basatanya (Bognár-Kutzián 1963; Meisenheimer 1989; Brummack, Diacones2014, fig. 14) as well as a number of other stratigraphic observations (Brummack, Diaconescu 2014, 245–246).

On the basis of numerous series of AMS determinations, coming from Hungary, Slovakia and Romania, the following scheme of absolute chronology of the Copper Age was established in the Great Hungarian Plain: Tiszapolgár (4420–4240 BC), Bodrogkeresztúr (4250–4070 BC) and Hunyadihalom (4020–3780 BC; see Brummack, Diaconescu 2014, 254–255, fig. 4–9).

Considering the second article (Stockhammer *et al.* 2015), devoted to the chronological analysis of burial complexes coming from the Neolithic and Early Bronze Age in southern Germany, the authors presented the values of radiocarbon indications of high precision (AMS) determined for the human bone samples of 140 individuals collected from 132 graves, from 11 cemeteries from the vicinity of Augsburg (Stockhammer *et al*. 2015, fig. 2, table 1). All sampled graves were researched provided that they contained a typologically unambiguous dated artefacts, mainly pins (Stockhammer *et al.* 2015, Figure 6). In addition, samples from the cemetery in Singen (Stockhammer *et al*. 2015, 7, Fig. 9) were re-analysed, which significantly "rejuvenated" the site which was important and known for the many years (Krause 1988, 169–180).

After analysing all dates (Stockhammer *et al*. 2015, table 2, fig. 3), the authors pointed out that the transition from the Late Neolithic to the Early Bronze Age occurred in southern Germany without any significant interruption or even the phenomenon of overlapping those periods about 2150 BC (Stockhammer *et al.* 2015, fig. 4) took place. In light of their research, the duration of the Early Bronze Age should be shortened from the generally accepted 750–700 years to only 450 years, *i.e.* from 2150 to 1700 BC.

The authors argue that in the course of the entire period of the Early Bronze Age, the pins typical for the A1 sub-period of the Bronze

Age were used and deposited. More technologically complex artefacts, traditionally associated with the A2 sub-period of the Bronze Age appeared for the first time around 1900 BC (Stockhammer *et al.* 2015, fig. 8). Therefore, there is no reason to view the transition of the A1 and A2 sub-periods of the Bronze Age as presented in the literature for the last 100 years. The data collected in this article indicate the complex process of coexistence of various (simple and technologically advanced) bronze objects at the same time.

It turned out that the A1 and A2 sub-periods of the Bronze Age should not be considered as two stages in the chronological chronology of the Bronze Age in southern Germany (Stockhammer *et al.* 2015, 28–29). In the light of our analyses, the A1 and A2 sub-periods of the Bronze Age are the consequence of different rate of adoption of bronze technology in southern Germany (A1) and in the area of the Únětice culture in eastern Germany, Bohemia, Moravia, western Poland and some parts of Slovakia and Austria (A2).

As a result, the A1 and A2 sub-periods were, in fact, different levels of ability and readiness for the adoption of the new bronze technology and the accompanying complex of beliefs and values. A1 and A2 are not a chronological phenomenon. These are rather spatial phenomena. The finds typical for A2 in southern Germany and the artefacts typical for A1 in the area of the Únětice culture should be interpreted as local acceptance of foreign products or their patterns rather than chronological phases (Stockhammer *et al.* 2015, 28–29).

The above examples do not discourage us from using the rules of traditional relative chronology. At the same time, they tend to take into account social factors that also shape the "behaviour" of artefacts in time. The coexistence of cultural phenomena was possible at the same time, which were considered to be in traditional archaeology the successive links of certain chronological sequences. It turns out (not for the first time) how much the results of the Bayesian analyses of series of AMS indications depend on the archaeologist's knowledge, which is a source of an a priori assumption made in such analyses. It enriches and gives nuances of our knowledge regarding the subsequence or contemporaneity of the researched events, but it does not "turn it upside down".

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