

Testing Reinecke's chronology of the Early Bronze Age with radiocarbon dating – New evidence from Southern Bavaria

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ABSTRACT

In this article we present a critical view of the current chronological framework for Early Bronze Age burials from Southern Bavaria, by using radiocarbon dating to re-examine Paul Reinecke's relative chronological classification system. We also examine chronological divisions established by other scholars based on his system. The results of our study show a complex pattern of local groups appropriating new types or styles of objects from others, which then influences the timeline for the appearance of such type objects. Our findings show that every region had its own socio-cultural history with a slightly different chronology.

KEYWORDS

Radiocarbon dating; Southern Bavaria; Lech Valley; Early Bronze Age; burials.

INTRODUCTION

Paul Reinecke's work on the chronological framework of the Early Bronze Age (REINECKE 1902; 1924) in Central Europe was the beginning of a long-lasting debate regarding how best to put diagnostic type objects into a larger framework and arrange them in chronological order. At the time he undertook his investigations, the number of archaeological contexts that could be evaluated was quite small, so he had to use sites from a large geographic area. This was one of the reasons why scholars from all over Europe started to establish their own systems mostly based on Reinecke's relative chronological divisions, so that their particular systems would be better calibrated to their unique locale.

The chronological framework used in current research on the Early Bronze Age in Southern Bavaria is still based on Paul Reinecke's system, but it has been adjusted several times with different methods and with regards to various materials. In summary, two schemes have evolved: one reflecting Reinecke's bisection (Br A1 and Br A2; REINECKE 1924) with sub-divisions (e.g. RUCKDESCHEL 1978, 293–304; INNERHOFER 2000, 18–19, 239–241), and the other dividing the Early Bronze Age into three parts based on cultural developments that could be seen in the Danubian koiné (e.g. CHRISTLEIN 1964; STEIN 1976, 62–63, 80; MÖSLEIN 1998; DAVID-ELBIALI – DAVID 2009, esp. fig. 11).

Since the 1980s, a huge number of Early Bronze Age burials have been discovered in the heartland of Paul Reinecke's domain in the course of large-scale rescue excavations. For our project, which was funded by the Heidelberg Academy of Sciences within the WIN-Kolleg Program 'Times of Upheaval: Changes of Society and Landscape at the Beginning of the Bronze Age', one substantial goal was to establish a chronological framework based on radiocarbon dates that would help to clarify the time-based cultural changes within the research area. We analysed 136 individuals dating to the Early Bronze Age and early Middle Bronze Age in the Lech Valley, eleven from the cemetery in Singen (Lake Constance) and four from the cemetery in Altenmarkt (Gäuboden). Our findings challenge the long-term understanding of the

chronological sequence of technological changes in this area and the societal changes that came with them.¹ In the light of our findings, the division in Br A1 with sheet metal objects and Br A2 with cast artefacts in particular, as well as the transition to the Middle Bronze Age, must be partially revised and reconsidered. The aim of this work was not to discredit the elaborate typo-chronological work done by researchers in the past with farsightedness, but to make people aware of the problems that occur when combining relative chronological phases with absolute dates. Radiocarbon dating has become much more precise over the last few decades. This allows it to be used as a powerful tool to address these problems, and to potentially solve them with new scientific methods (**Fig. 1**).

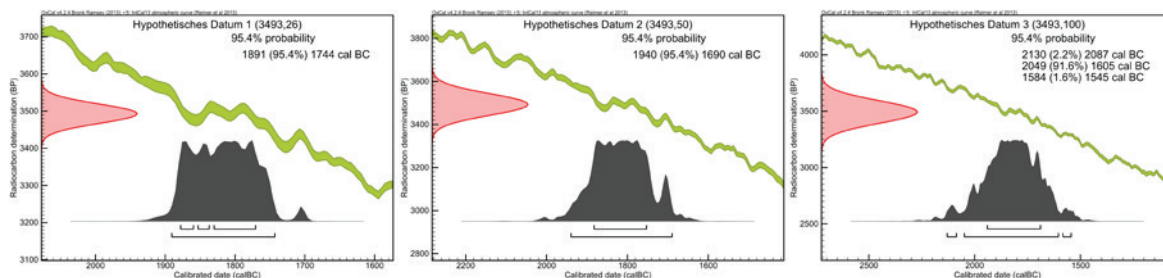


Fig. 1: Compilation of the same radiocarbon age with three deviations differing in precision. The first one (± 26 years) complies with the average deviation of the Augsburg sample set (Graphic: Ken Massy).

RESULTS OF RADIOCARBON DATING

All radiocarbon dates presented in this study were obtained from inhumation burials spanning the period from the Corded Ware Complex till the beginning of the Middle Bronze Age, most of them from the Lech Valley (**Fig. 2**). From the beginning of the Bell Beaker period, small burial grounds were founded. Cemeteries grew larger throughout the Early and Middle Bronze Age with up to 73 individuals per site. In this paper, we concentrate on the radiocarbon dates obtained from burials belonging to the Early Bronze Age (EBA).

We conducted Bayesian modelling of the Bell Beaker period and the EBA, with the assumption that the burials assigned to the Bell Beaker period were earlier than the burials assigned to the EBA. The results very clearly showed that there has neither been a significant overlap nor a hiatus between the two periods. The EBA burials started around 2140 BC. This is the date from which Reinecke's phase Br A begins not only in the Lech Valley, but also further west. Analysis recently performed on material from the cemetery of Singen shows the same results (STOCKHAMMER *et al.* 2015, 8, fig. 5).²

The idea of putting artefacts in a chronological order has often led to an evolutionistic notion of how objects have changed in shape and ornamentation as well as in the technique with which they are made. These preconceived notions were then used to determine type objects for specific chronological phases. For many objects of the EBA, the theories regarding how object types would continuously evolve has proven to be correct. Good examples are pendants

- 1 For sampling strategy and sampled sites of the Lech Valley see: STOCKHAMMER *et al.* 2015, 4, fig. 2; KNIPPER *et al.* 2017, 10087–10088. For sampled burials of Altenmarkt see: MASSY *et al.* 2018.
- 2 Even in neighbouring regions, e.g. the Western Carpathian Basin, the end of the Bell Beaker Complex could be determined via radiocarbon dating to be around 2150 BC (SZABÓ 2017, 107).

made of boar tusks of the Final Neolithic, which were then replaced by metal sheet pendants of a lunular shape, copying the boar tusk pendants of the preceding period (BERTEMES – HEYD 2015, 569, fig. 5). In a third phase, the ornaments which constituted the traditional element of these objects were transferred to metal sheet discs and reordered due to the new shape. The radiocarbon dates confirm the relative-chronological order of these phases (Fig. 3).³

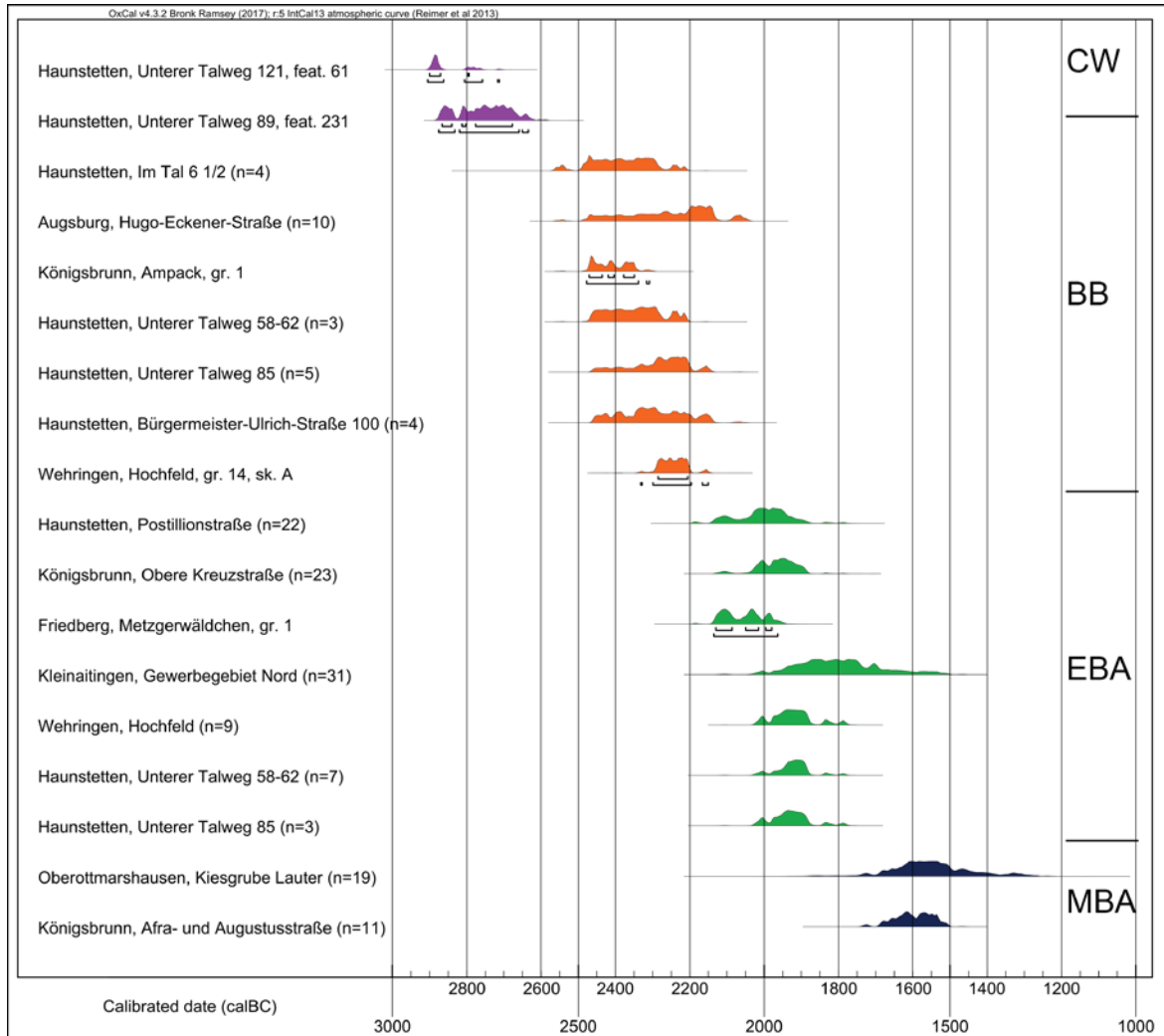


Fig. 2: Sum calibrations of cemeteries and radiocarbon dated single burials from the Lech Valley. CW: Corded Ware, BB: Bell Beaker, EBA: Early Bronze Age MBA: Middle Bronze Age (Graphic: Ken Massy).

3 The radiocarbon dates from Schwabmünchen-Mittelstetten were conducted and financed as part of the DFG-project (ME 3372/6-1) 'Ein außergewöhnliches Grab der Frühbronzezeit mit Zinnperlen aus Bayerisch-Schwaben' under the direction of Carola Metzner-Nebelsick (Ludwig-Maximilian-University Munich).

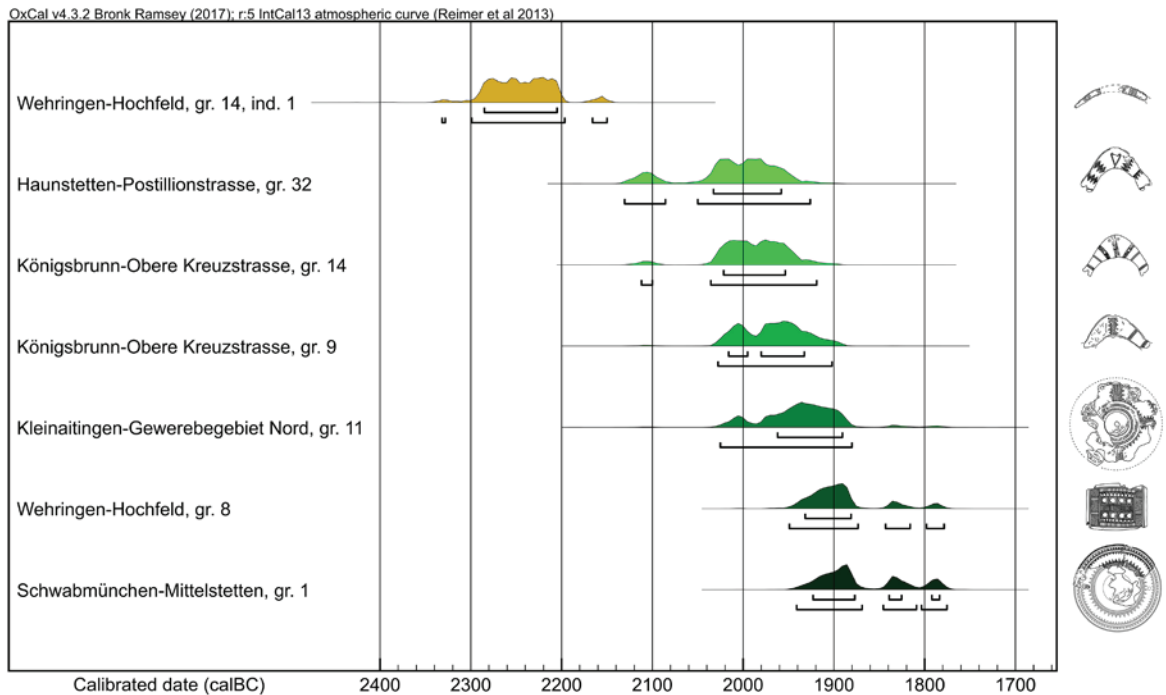


Fig. 3: Radiocarbon dates of burials from the Bell Beaker period (top) and Early Bronze Age (others) from the Lech Valley associated with pendants and metal sheet plates (Graphic: Ken Massy).

REGIONALITY AS A PROBLEM FOR WIDE RANGE RELATIVE CHRONOLOGY

Pins and their classification have been one of the main tools used to define the chronological phases of the EBA. They are a typical grave good and therefore are often found in combination with other objects. However, one main issue is that most of the burials contain only one single pin, making it almost impossible to develop a combination statistic solely based on pins. The definition of the relative chronological phases and sub-phases has been developed and refined by many scholars (e.g., W. Ruckdeschel, W. David, F. Innerhofer, etc.). Such scholars have used the nomenclature developed by Reinecke ‘Br A1’ and ‘Br A2’ to refer to EBA phases and use pins as a central indicator to assign these chronological phases. The phase Br A1 is generally divided into two, namely Br A1a and Br A1b, which ideally should reflect successive phases.

We can test the assumption that the objects assigned to these two phases are consecutive by using the radiocarbon dates of burials with pins from Br A1a and Br A1b into a Bayesian model (Fig. 4).⁴ The agreement indices of the single dates near the end of phase Br A1a and at the beginning of Br A1b are far below 60, as is the value for the entire model (A: 5). This means that a strict sequence is not plausible, even if it is the case that some of the sub-phase Br A1b pins were in use longer than the ones from Br A1a.⁵

4 For the definition of the pin types and their relative dating see STOCKHAMMER *et al.* 2015, 8.

5 The discussion of the individual dates and measurements is discussed in detail in MASSY 2018.

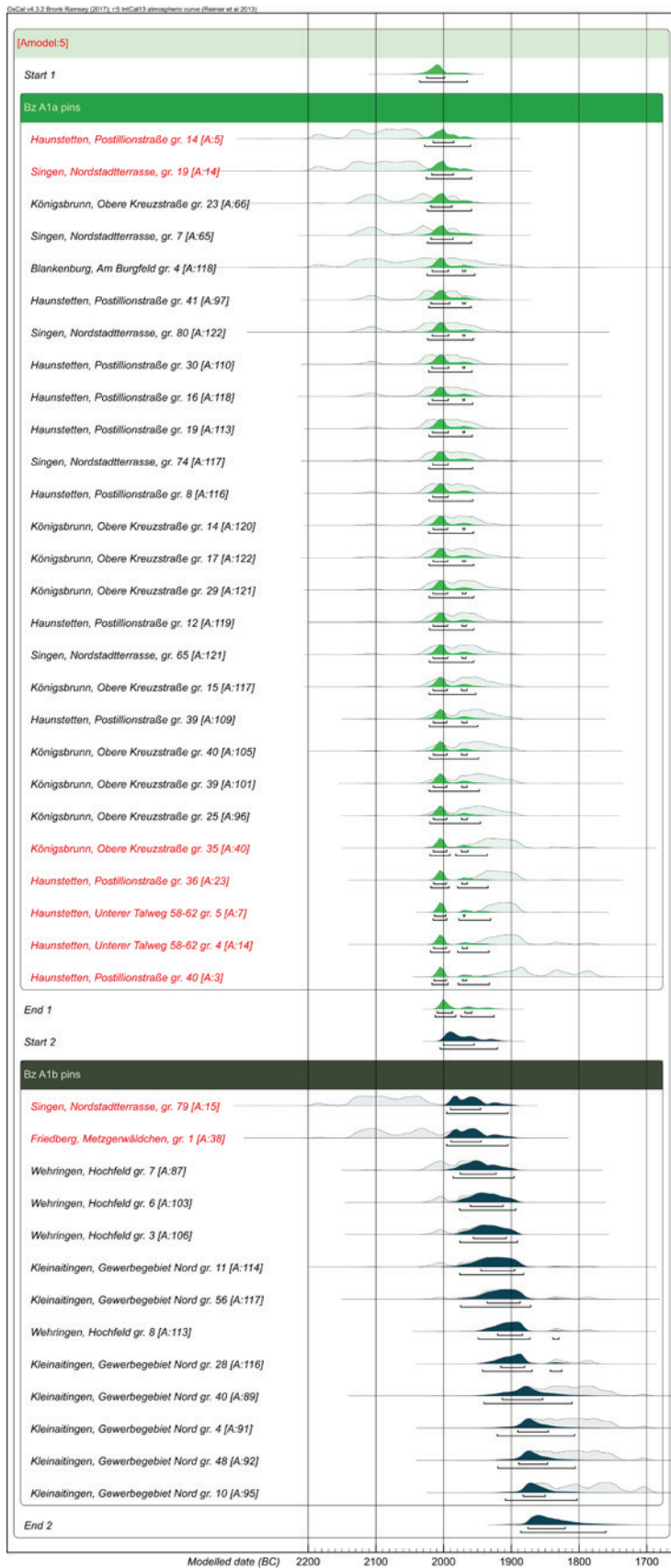


Fig. 4: Bayesian modelling of an assumed sequence of Br A1a and Br A1b pin types (Graphic: Ken Massy).

This finding constitutes the core of our challenge to P. Reinecke's relative chronological classification system. If we take a closer look at distribution maps from pins attributed to the sub-phases Br A1a (e.g. KRAUSE 1988, fig. 25 – paddle headed pins) and Br A1b (KRAUSE 1988, fig. 34 – pins of the type Horkheim; GERLOFF 1993, fig. 3 – loop headed pins), some interesting observations can be made. The distribution of pins from both relative-chronological 'sub-phases' reveal areas where only Br A1a types could be found, even when the total number of burials in that very region was very high (e.g. the Munich Gravel Plain or the Nördlinger Ries). When there is a high number of burials, one would expect to find burials belonging to both time periods, including Br A1b (**Pl. 2/1**).

Pins are not the only object that has been used to establish relative-chronological orders. Certain copper artefacts that were part of headdresses worn by women previously seemed to fit in the Reinecke system. Spiral-tutuli were chronologically divided by their size, such that the smaller and cone-shaped ones (type Zamdorf) were assigned to Br A1a, and larger ones with a spike in the middle (type Eisenstorf) were assigned to Br A1b and A2a (RUCKDESCHEL 1978, 189; BÖHM – MÖSLEIN 2003, 67; DAVID 2015, 91). The same division was assumed for metal sheet tubes, where size was seen as an indicator that the object belonged to an early or later time period. However, taking the distribution of these objects (**Pl. 2/2**) and the radiocarbon dates from the relevant graves in the Lech Valley (**Fig. 5**) into account, the same result emerges as we have previously discussed with pins. The object types are distributed in geographically distinct patterns, rather than showing a chronological order.

Comparing the communities of the Lech Valley (Lechgroup) with those of the Munich Gravel Plain (Isargroup), the previously mentioned differences can be summed up as follows: in the Lechgroup, pins assigned to both relative chronological sub-phases (Br A1a and A1b) are well represented, whereas the burials from the Isargroup lack pins assigned to phase Br A1b. However, the lack of Br A1b pins is not due to a lack of burials in the Isargroup dating to the Br A1b time period. It rather shows that pins of the Br A1a type were still being placed into graves in that region at a time when inhabitants of the Lech Valley were already choosing other types of pins, the Br A1b type, as burial goods. The examples of the spiral-tutuli and long metal sheet tubes further reinforce this finding. This indicates that we have to be aware of micro-regional differences in burial customs when sorting type objects into a relative chronological order.

A recently published compilation of radiocarbon dates of eyelet pins – previously unanimously assigned to the relative chronological phase Br A2a (RUCKDESCHEL 1978, 127–130, 299–300; RUCKDESCHEL 1985, 168; DAVID 1998, 113–117; BÖHM – MÖSLEIN 2003, 63; BARTELHEIM 1998, 65; LAUERMANN 2003, 558–561, 614–618) – from the 'Circumharzer Gruppe' in Central Germany illustrates another problem with the existing relative chronological order (KNOLL – MELLER 2016, 296, fig. 11). This type of pin has been seen as decisive for defining the start of Br A2 in a supra-regional context. Five of the fifteen radiocarbon dates from burials with eyelet pins in Central Germany (group 1) have 2-sigma ranges from around 2030–1900 BC, while the other ones date to around 1900–1700 BC. Comparing these radiocarbon dates with those of pin types assigned to Br A1 from the Lech Valley, one finds inconsistencies in the timing of the change from Br A1 and A2, a crucial turning point in Reinecke's system. The vast majority of absolute dates for Br A1 (a and b) pin types in the Lech group falls within this plateau in the calibration curve from 2040–1880 BC and can therefore be seen as contemporaneous with the early examples of eyelet pins of the 'Circumharzer Gruppe' (STOCKHAMMER *et al.* 2015, 26 fig. 6).⁶ Furthermore, the later dates for Br A1b pins of the Lech group are more recent than

6 The same could also be recognised regarding the radiocarbon dates of loop headed pins from the cemetery Prague-Miřkovice in Central Bohemia (ERNÉE 2015, fig. 174).

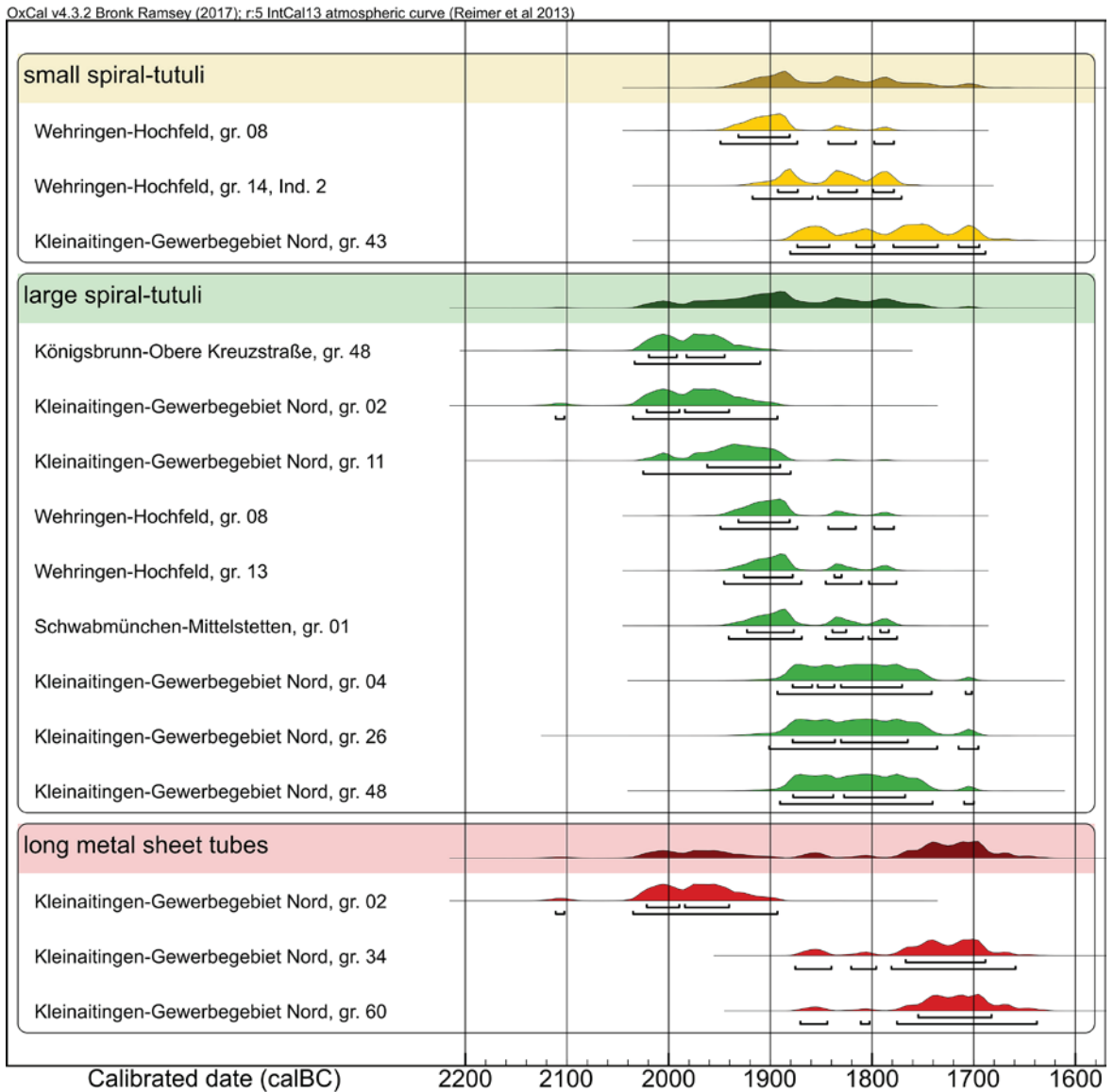


Fig. 5: Radiocarbon dates of burials and their sum calibration from the Lech Valley associated with small and large spiral-tutuli as well as long metal sheet tubes (Graphic: Ken Massy).

the early Br A2a pins from Central Germany (**Fig. 6**). The dates for Br A2a (b) pins from the Lech Valley (eyelet pins, sleeve-headed pins and pins with spherical heads) are the same as the more recent dates of their northerly counterparts.

The eyelet pin, in general, thus cannot be taken as a type object for the relative chronological phase of Br A2a.⁷ However, a more detailed classification of eyelet pin types, especially based on their ornamentation, established by F. Knoll and H. Meller has shown that eyelet pins can be subdivided into three major chronologically distinct groups. The most recent group (group 3: ca. 1900–1700 BC) has horizontal lines on the necks of the pins (KNOLL – MELLER 2016, fig. 12).

7 For a dating of eyelet pins in phase Br A1b see: KNOLL – MELLER 2016, 297.

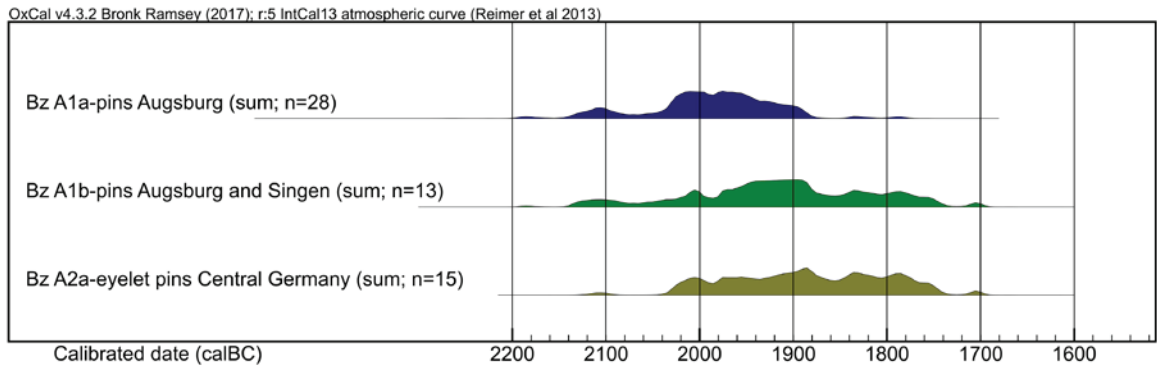


Fig. 6: Sum calibrations of Br A1a (top) and Br A1b (middle) pin types from Southern Bavaria and sum calibration of eyelet pins from Central Germany (bottom) (data for eyelet pins: KNOLL – MELLER 2016, 308–355; graphic: Ken Massy).

One of these was found in burial 37 (feature 119) in the cemetery of Kleinaitingen – Gewerbegebiet Nord in the Lech Valley and could be dated to 1883–1737 BC (88.3 %) and 1716–1696 BC (7.1 %). This matches perfectly with the dates for eyelet pins from Central Germany, approximately 1900–1700 BC. So far, no eyelet pins that match Knoll’s and Meller’s earlier groups 1 and 2 have been found in Southern Germany (KNOLL – MELLER 2016, fig. 8b),⁸ which is likely the reason for a relative-chronological dating of eyelet pins in this area to the Br A2 phase.

We now know that radiocarbon dates of Br A1 pin types from the Lech group also fall onto the plateau of the calibration curve after 1880 BC and that there are certainly Br A2a pins from the ‘Circumharzer Gruppe’ whose 2-sigma ranges of the radiocarbon dates end before this calendar date. At the same time, it is clear that eyelet pins show a time-based evolution that starts in the Únětice Culture, when Br A1 pin types in Southern Germany were most common. The pin types currently classified as Br A1 and Br A2 can thus be partly seen as different expressions/preferences in used/deposited artefacts at the same time in different regions, rather than indications of objectively sequential time periods.

The small cemetery of Altenmarkt-Am Stadtwald at the eastern border of the Danube Group is another example that highlights the issue of regionality as a problem for relative chronological dating. Four individuals were radiocarbon dated and all of the measurements showed sufficient collagen preservation above 3 %. Grave 6 contained a pin with a perforated and spherical head (*schrägdurchlochte Kugelkopfnadel*) of the Matzhausen type, which was formerly assigned to the relative chronological phase Br A2a–b (DAVID 1998, 118). Two pins with a perforated and spherical head and twisted shaft of the Malching/Langquaid type were found in graves 8 and 10. These types of pins are characteristic for the phase Br A2b (DAVID 1998, 118–119). Surprisingly, the radiocarbon dates show once more where the limits of relative chronology lie. The 2-sigma ranges of the more recent radiocarbon dates of the graves (graves 6, 7, 10) end before 1680 BC, and therefore cannot close the gap to the Middle Bronze Age (beginning around 1600–1550 BC), even if pins assigned to phase Br A2c are not present in the cemetery (**Fig. 7**; HAFNER – SUTER 2003, 337; MÜLLER – LOHRKE 2009, 28–32; DAVID 2015, 106–107; INNERHOFER 2013, 448–449). Even more important are the early dates assigned to the individual and accompanying grave inventory from grave 8. The 2-sigma range of this particular date spans from around 2020–1880 BC and falls

8 The eyelet pins of the most recent group (group 3) corresponds to ‘type 1’ in the distribution map.

onto the steep part of the calibration curve before the plateau from 1880–1770 BC. This indicates that the Br A2b-type pin is actually contemporaneous with some Br A1-pins from Southern Bavaria.

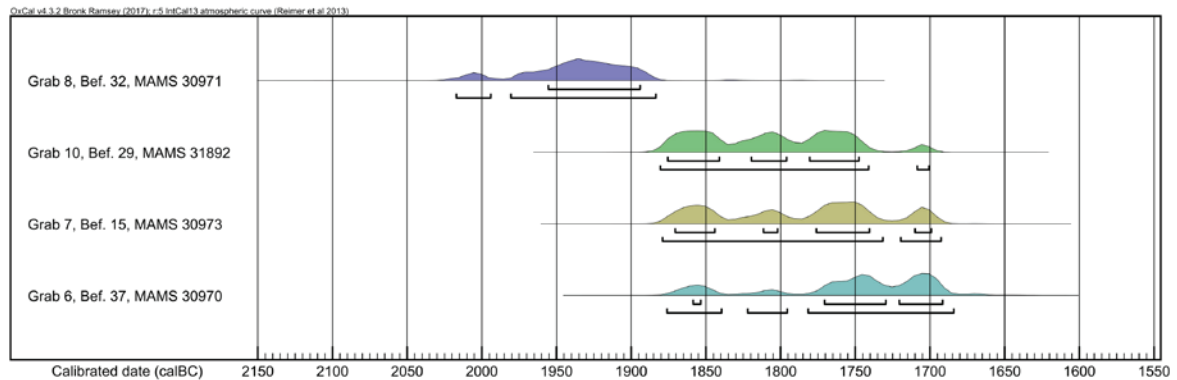


Fig. 7: Radiocarbon dates of the burials from Altenmarkt, Am Stadtwald (Graphic: Ken Massy).

The radiocarbon dated pins from the cemetery at Altenmarkt are interesting in and of themselves, and when taking the distribution of those pin types into account, the same problem emerges as was previously described in relation to eyelet pins (**Fig. 8**). Pins with spherical and perforated heads of the Matzhausen type are well known in many parts of Early Bronze Age Southern Bavaria, Bohemia, and Moravia, whereas those with twisted shafts (Malching/Langquaid type) show a different distribution, with most of the finds being located along the Danube River. In the case of the 'Straubing Culture' in Southern Bavaria, only the Danube group has a sufficient number of graves with artefacts assigned to phases Br A1 and Br A2 (b and c) to carry out a relative chronological comparison. In the other parts of Southern Bavaria, such a relative-chronological comparison of type artefacts from those two phases is not really possible, because of the insufficient amount of pins.

GRAVE GOODS AND BURIAL CUSTOMS AS A PROBLEM/CHANCE FOR RELATIVE CHRONOLOGY IN THE LATER EBA

The cemetery of Kleinaitingen-Gewerbegebiet Nord is crucial for understanding the difficulties faced when establishing a chronological framework based on typo-chronology. In Fig. 2, the long occupancy of the graveyard is visible with the 2-sigma ranges of the dates of the most recent graves reaching 1500 BC. From a typo-chronological point of view, on the other hand, the burials would have dated from the Br A1 (a) phase (*Ruderkopfnadel*/pin with paddle-shaped head) to the Br A2a or Br A2b phase (pin with perforated spherical head type Matzhausen) at the latest (DAVID 1998, 118–119; DAVID 2015, 100). Its main period of occupancy would have been assigned to the sub-phase Br A1b, which traditionally would not have been later than 1950 BC (HAFNER – SUTER 2003, 337; DAVID 2015, 92).

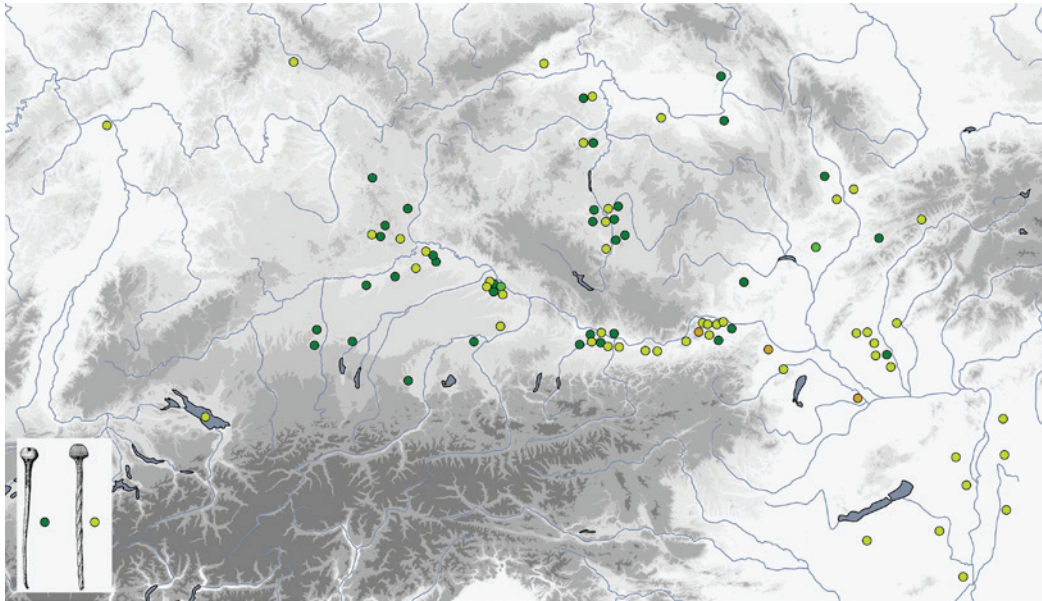


Fig. 8: Distribution map of pins with spherical and perforated head (*Kugelkopfnadeln*) of the type Matzhausen and Malching/Languaid (Map basis: JARVIS et al. 2008; graphic: Ken Massy after: INNERHOFER 2000, Karte 2 with additions).

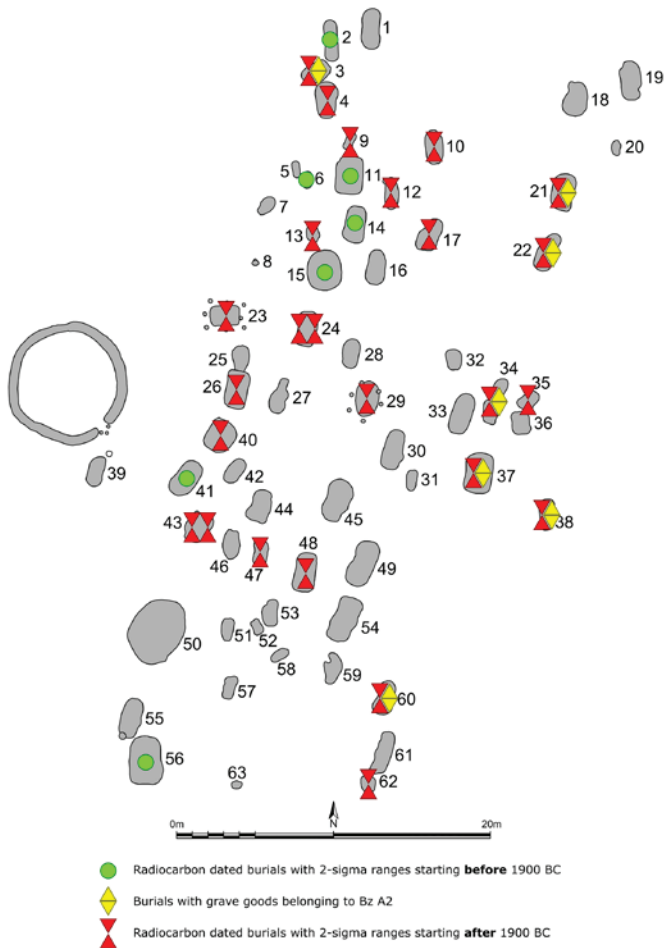


Fig. 9: Early Bronze Age cemetery of Kleinaitingen-Gewerbegebiet Nord with radiocarbon dated burials with their 2-sigma ranges starting before (dots) and after (hour-glass symbol) 1900 BC. Type objects which could be dated relatively chronologically to Br A2 are marked with triangles facing with bases (Graphic: Ken Massy).

Only seven burials and related individuals from this cemetery can be assigned to the Br A2 phase on the basis of ‘type fossils’. The radiocarbon dates, however, show that the 2-sigma ranges from 25 of the 32 sampled individuals begin just after 1900 BC (**Fig. 9**). Many of those graves (after 1900 BC) contain ‘classic’ Br A1-grave goods. The five most recent dates (between 1740 and 1500 BC) in the cemetery close the chronological gap between the Early and Middle Bronze Age. It is these most recent burials that contain any archaeologically dateable finds at all, which clearly complicates the situation when looking at relative chronology only (MASSY 2018, fig. 38). As a result of our radiocarbon dating analysis, we now have evidence for late-Early Bronze Age burials at this site, which would otherwise have been invisible using only relative chronological dating.

The transition from the Early to the Middle Bronze Age is one of the crucial turning points in Central European prehistory, but its chrono-cultural process is still not well understood. One example from the Lech Valley illustrates this problem. The previously mentioned cemetery at Kleinaitingen is situated only a few hundred meters away from the Middle Bronze Age graveyard at Oberottmarshausen-Kiesgrube Lauter. The first is characterised by inhumations in a crouched position with sex-specific orientation (RUCKDESCHEL 1968, 27–38; PRIMAS 1977, 52; PRIMAS 2008, 52; HÄUSLER 1990, 340–341), whereas the latter shows only elongated inhumation without sex-specific differences, which is the typical burial practice in Southern Germany throughout the Middle Bronze Age. Around 6 km to the north of Oberottmarshausen, there is another Middle Bronze Age site (Königsbrunn-Afra- und Augustusstrasse) that has also been radiocarbon dated. The change from crouched to elongated burials does not occur abruptly, but rather occurs during a transition period of approximately 100 to 150 years (**Pl. 2/3**). For burials dating to that time, grave goods are rare and are often restricted to pottery. The transition from metal artefacts to pottery presents another challenge in relative chronology, as it is difficult to compare and combine these two lines of evidence.

CONCLUSION

Paul Reinecke and others attempted to use archaeological evidence from a vast geographical area to establish a relative chronological order, and, certainly, they had great knowledge of almost all the finds available at the time they were working. However, the enormous number of new archaeological sites and large quantity of recently discovered material from the Early Bronze Age in Central Europe make it impossible today to compare and situate every artefact under investigation into such a framework. To the contrary, it is exactly this increase in findings, the firmly established relative chronological order and the combination of the latter with ‘new’ scientific methods that have shown new possibilities and limits for establishing a time-based framework of Early Bronze Age material culture.

For Southern Bavaria, we showed the importance of combining the relative chronology of type artefacts with radiocarbon dates to rethink micro-regional differences in appropriating distinctive material culture and burial customs. The example of Br A1a and Br A1b pin types in Bavaria has shown very clearly that only artefacts with an even distribution within the research area can serve as a marker for a chronological phase.

The phases and sub-phases of the relative chronology can be seen as groups or combinations of type objects with different chronological emphases in different regions. These groupings can still be used to show supra-regional contacts and interconnections at certain points in time. They often contain a similar combination of type objects, even if occurring in different places at different times, as we demonstrated for large spiral-tutuli and long metal sheet tubes.

Our broad use of radiocarbon dating has shown its advantages, especially at times for which there is a reduced frequency of grave goods, for example at the very end of the EBA and beginning of the MBA. This technology allows not only changes in typo-chronology but also in burial customs to be evaluated independently from their associated grave goods. We propose a calendar date-based phasing of (Early) Bronze Age material in accordance with the plateau-sections of the calibration curves to obtain a better understanding of socio-cultural development in Europe during this period. It is important in this regard to take into account the local variations in type artefact evolution in different regions.

BIBLIOGRAPHY

- BARTELHEIM, M. 1998: *Studien zur böhmischen Aunjetitzer Kultur. Chronologische und chorologische Untersuchungen*. Universitätsforschungen zur Prähistorischen Archäologie 46. Bonn.
- BERTEMES, F. – HEYD, V. 2015: 2200 BC – Innovation or Evolution? The genesis of the Danubian Early Bronze Age. In: H. Meller – H.W. Arz – R. Jung – R. Risch (eds.): *2200 BC – Ein Klimasturz als Ursache für den Zerfall der Alten Welt?* 7. Mitteldeutscher Archäologentag in Halle (Saale) vom 23.–26. Oktober 2014. Tagungen des Landesmuseums für Vorgeschichte Halle 12/2. Halle (Saale), 561–578.
- BÖHM, K. – MÖSLEIN, St. 2003: Frühbronzezeitliche Grabfunde aus Thurasdorf, Gde. Parkstetten, Lkr. Straubing-Bogen. In: K. Schmotz (ed.): *Vorträge des 21. Niederbayerischen Archäologentages*. Rahden, 53–74.
- CHRISTLEIN, R. 1964: Beiträge zur Stufengliederung der frühbronzezeitlichen Flachgräberfelder in Süddeutschland. *Bayerische Vorgeschichtsblätter* 29, 25–63.
- DAVID, W. 1998: Zu früh- und ältermittelbronzezeitlichen Grabfunden in Ostbayern. In: J. Michálek – K. Schmotz – M. Zápotocká (eds.): *Archäologische Arbeitsgemeinschaft Ostbayern/West- und Südböhmen*. 7. Treffen in Landau [Isar] 11.– 14. Juni 1997. Rahden, 108–129.
- DAVID, W. 2015: Bronzedepotfunde der Früh- und Mittelbronzezeit in Ostbayern. In: O. Chvojka – M. Chytráček – H. Gruber – L. Husty – J. Michálek – R. Sandner – K. Schmotz – St. Traxler (eds.): *Fines Transire* 24. Archäologische Arbeitsgemeinschaft Ostbayern/West- und Südböhmen/Oberösterreich. Rahden, 87–112.
- DAVID-ELBIALI, M. – DAVID, W. 2009: À la suite de Jacques-Pierre Millotte, l'actualité des recherches en typologie sur l'âge du Bronze, le Bronze ancien et le début du Bronze moyen: cadre chronologique et liens culturels entre l'Europe nord-alpine occidentale, le monde danubien et l'Italie du Nord. In: A. Richard – P. Barral – A. Daubigny – G. Kaenel – C. Mordant – J.-F. Piningre (eds.): *L'isthme européen Rhin-Saône-Rhône dans la Protohistoire*. Approches nouvelles en hommage à Jacques-Pierre Millotte in Besançon vom 16.–18. Oktober 2006. Besançon, 295–324.
- ERNÉE, M. 2015: *Prag-Miškovice. Archäologische und naturwissenschaftliche Untersuchungen zu Grabbau, Bestattungssitten und Inventaren einer frühbronzezeitlichen Nekropole*. Römisch-Germanische Forschungen 72. Darmstadt.
- GERLOFF, S. 1993: Zu Fragen mittelmeerländischer Kontakte und absoluter Chronologie der Frühbronzezeit in Mittel- und Westeuropa. *Prähistorische Zeitschrift* 68, 58–102.
- HAFNER, A. – SUTER, P. 2003: Vom Endneolithikum zur Frühbronzezeit. Wandel und Kontinuität zwischen 2400 und 1500 v. Chr. *Archäologisches Korrespondenzblatt* 33, 325–343.
- HÄUSLER, A. 1990: Geschlechtsdifferenzierte Bestattungssitten im Neolithikum und in der frühen Bronzezeit Mitteleuropas. *Saeculum* 41, 332–348.
- INNERHOFER, F. 2000: *Die mittelbronzezeitlichen Nadeln zwischen Vogesen und Karpaten. Studien zur Chronologie, Typologie und regionalen Gliederung der Hügelgräberkultur*. Universitätsforschungen zur Prähistorischen Archäologie 71. Bonn.

- INNERHOFER, F. 2013: Von der frühen zur mittleren Bronzezeit in Süddeutschland – Wandel oder Zäsur? In: H. Meller – F. Bertemes – H.-R. Bork – R. Risch (eds.): *1600 – Kultureller Umbruch im Schatten des Thera-Ausbruchs?* 4. Mitteldeutscher Archäologentag in Halle (Saale) vom 14.–16. Oktober 2011. Tagungen des Landesmuseums für Vorgeschichte Halle 9. Halle (Saale), 443–451.
- JARVIS *et al.* 2008 = Jarvis, A. – Reuter, H.I. – Nelson, A. – Guevara, E.: *Hole-filled seamless SRTM data V4*, International Centre for Tropical Agriculture (CIAT). Available online: <http://srtm.csi.cgiar.org> (visited 04/07/2018).
- KNIPPER *et al.* 2017 = Knipper, C. – Mittnik, A. – Massy, K. – Kociumaka, C. – Kucukkalipci, I. – Maus, M. – Wittenborn, F. – Metz, S.E. – Staskiewicz, A. – Krause, J. – Stockhammer, P. W.: *Female Exogamy and Gene Pool Diversification at the Transition from the Final Neolithic to the Early Bronze Age in Central Europe*. PNAS, 2017, 10083–10088. Available online: <https://doi.org/10.1073/pnas.1706355114> (visited 04/07/2018).
- KNOLL, F. – MELLER, H. 2016: Die Ösenkopfnadel – Ein „Klassen“-verbindendes Trachtelement der Aunjetitzer Kultur. Ein Beitrag zu Kontext, Interpretation und Typochronologie der mitteldeutschen Exemplare. In: H. Meller – H.P. Hahn – R. Jung – R. Risch (eds.): *Arm und Reich – Zur Ressourcenverteilung in prähistorischen Gesellschaften*. 8. Mitteldeutscher Archäologentag in Halle (Saale) vom 22.–24. Oktober 2015. Tagungen des Landesmuseums für Vorgeschichte Halle 14. Halle (Saale), 283–369.
- KRAUSE, R. 1988: *Die endneolithischen und frühbronzezeitlichen Grabfunde auf der Nordstadtterrasse von Singen am Hohentwiel*. Forschungen und Berichte zur Vor- und Frühgeschichte in Baden-Württemberg 32. Stuttgart.
- LAUERMANN, E. 2003: *Studien zur Aunjetitz-Kultur im nördlichen Niederösterreich*. Universitätsforschungen zur prähistorischen Archäologie 99. Bonn.
- MASSY, K. 2018: *Gräber der Frühbronzezeit im südlichen Bayern*. Untersuchungen zu den Bestattungs- und Beigabensitten sowie gräberfeldimmanenten Strukturen. Mit Beiträgen von Nadja Hoke, Anja Staskiewicz, Wolf-Rüdiger Teegen und Stephanie Panzer. Materialhefte zur Bayerischen Archäologie 107. Kallmünz.
- MASSY *et al.* 2018 = Massy, K. – Hanöfner, St. – Carlich-Witjes, N. – Stockhammer, Ph.W.: Früh- und ältermittelbronzezeitliche Gräber und Siedlungsreste aus Altenmarkt – Am Stadtwald, Gemeinde Osterhofen, Lkr. Deggendorf. In: L. Husty – K. Schmotz (eds.): *Vorträge des 36. Niederbayerischen Archäologentages*. Rahden, 123–174.
- MÖSLEIN, St. 1998: Die Straubinger Gruppe der donauländischen Frühbronzezeit – frühbronzezeitliche Keramik aus Südostbayern und ihre Bedeutung für die chronologische und regionale Gliederung der frühen Bronzezeit in Südbayern. *Bericht der Bayerischen Bodendenkmalpflege* 38, 37–106.
- MÜLLER, J. – LOHRKE, B. 2009: Neue absolut chronologische Daten für die süddeutsche Hügelgräberbronzezeit. *Germania* 87, 25–39.
- PRIMAS, M. 1977: Untersuchungen zu den Bestattungssitten der ausgehenden Kupfer- und frühen Bronzezeit. Grabbau, Bestattungsformen und Beigaben Sitten im südlichen Mitteleuropa. *Berichte der Römisch-Germanischen Kommission* 58, 1–160.
- PRIMAS, M. 2008: *Bronzezeit zwischen Elbe und Po. Strukturwandel in Zentraleuropa 2200–800 v. Chr.* Universitätsforschungen zur prähistorischen Archäologie 150. Bonn.
- REINECKE, P. 1902: Beiträge zur Kenntnis der frühen Bronzezeit Mitteleuropas. *Mitteilungen der Anthropologischen Gesellschaft Wien* 32, 104–129.
- REINECKE, P. 1924: Zur chronologischen Gliederung der süddeutschen Bronzezeit. *Germania* 8, 43–44.
- RUCKDESCHEL, W. 1968: Geschlechtsdifferenzierte Bestattungssitten in frühbronzezeitlichen Gräbern Südbayerns. *Bayerische Vorgeschichtsblätter* 33, 18–44.
- RUCKDESCHEL, W. 1978: *Die frühbronzezeitlichen Gräber Südbayerns. Ein Beitrag zur Kenntnis der Straubinger Kultur*. Antiquitas II, 11. Bonn.
- RUCKDESCHEL, W. 1985: Das frühbronzezeitliche Gräberfeld von Mintraching, Ldkr. Regensburg. *Bayerische Vorgeschichtsblätter* 50, 127–182.
- STEIN, F. 1976: *Bronzezeitliche Hortfunde in Süddeutschland*. Saarbrücker Beiträge zur Altertumskunde 23. Bonn.

- STOCKHAMMER *et al.* 2015 = Stockhammer, P. W. – Massy, K. – Knipper, C. – Friedrich, R. – Kromer, B. – Lindauer, S. – Radosavljević, J. – Wittenborn, F. – Krause, J.: Rewriting the Central European Early Bronze Age Chronology: Evidence from Large-Scale Radiocarbon Dating. *PLoS ONE* 10/10, e0139705. Available online: <https://doi.org/10.1371/journal.pone.0139705> (visited 04/07/2018).
- SZABÓ, G. 2017: Problems with the periodization of the Early Bronze Age in the Carpathian Basin in light of the older and recent AMS radiocarbon data. *Archeometriai Műhely* 14/2, 99–116.

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