

## **The Neolithic burial sequence at Flintbek LA 3, north Germany, and its cart tracks: a precise chronology**

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(<http://antiquity.ac.uk/ant/085/ant0850742.htm>). Here we publish supplementary material.

*Radiocarbon dating of 32 stratigraphic samples aided by Bayesian analysis has allowed the author to produce a high precision chronology for the construction and development of a continental Neolithic long barrow for the first time. She shows when and how quickly people living on the shore of the Baltic adopted pit graves, megalithic chambers and long barrows. Better than that, she provides a date for the famous cart tracks beneath the final barrow to 3420–3385 cal BC. Although other parts of the package — ploughing and pottery — are late arrivals, her analysis of the global evidence shows that Flintbek remains among the earliest sightings of the wheel in northern Europe.*

*Keywords:* northern Europe, southern Scandinavia, Neolithic, Funnel Beaker culture, non-megalithic and megalithic graves, wheeled vehicles, chronology, radiocarbon, Bayesian method, monumental landscape

**Table 3. The appearance of wheeled vehicles: a review of the evidence.**

No.	Site	Dating information	Lab. no.	Dates	Calibrated age (BC)	Archaeologically estimated age (BC)	References
<b>Category A: definite vehicles, dated scientifically</b>							
1	<b>Bronocice</b> Poland Pictogram on pottery Funnel Beaker settlement	<sup>14</sup> C date Cattle bone	GrN-19612	4725±50	3631–3380	>3380	Bakker <i>et al.</i> 1999: 778, 780, tab. 1; Burmeister in press
2	<b>Flintbek</b> Germany Cart tracks Funnel Beaker long barrow	Sequence of 18 AMS dates Charred wood, glume base, human bones	See this article		3423–3390	>3390	Mischka, this article
3	<b>Pilkmoose</b> Denmark Wooden wheel	Dendrodate Wood			2935	2935	Christensen 2007: 231; Johannsen & Laursen 2010: 19
4	<b>Stare gmajne</b> Slovenia Wooden wheel with axle Settlement	<sup>14</sup> C date of axle <sup>14</sup> C date of wheel Wood	VERA-2560 VERA-2561	4480±25 4530±35	3357–3116 3328–3116	>3116 3098	Velušček <i>et al.</i> 2009: 218–21 Velušček 2002; Maran 2004a: 269; Schlichtherle 2004: 299–301; Burmeister in press
5	<b>XV (Le)</b> Germany Wooden axle Corduroy road	<sup>14</sup> C date of axle C821 Wood		4412±32	3094–2936	>2936	Burmeister 2004: 329
6	<b>VII (Pr)</b> Germany Wooden axle Corduroy road	<sup>14</sup> C date of axle C854 Wood		4407±31	3091–2936	>2936	Burmeister 2004: 329
7	<b>XV (Le)</b> Germany Wooden axle Corduroy road	<sup>14</sup> C date of axle C820 Wood		4367±33	3013–2921	>2921	Burmeister 2004: 329

8	<b>VII (Pr)</b> Germany Wooden axle Corduroy road	<sup>14</sup> C date of axle C815 Wood		4338±60	3022–2896	>2896	Burmeister 2004: 329
9	<b>Zürich-Presssehaus</b> Switzerland Wooden wheel	<sup>14</sup> C date of wheel Wood		4290±60	3013–2876	>2876	Ruoff & Jacomet 2002: 36
10	<b>Kurgan Sugokleja, Grave 20</b> Ukraine Wooden wheels	Dendrodate (in combination with <sup>14</sup> C) Wood			2845 BC	2845	Nikolova & Kaiser 2009: 232–7
<b>Category B1: definite vehicles, context with scientific dates not securely related</b>							
11	<b>Uruk</b> Iraq Clay tablets	Charcoal?, Cultural layer, not <i>in situ</i>	Hd-? Hd-13042-12731 Hd-13043-12732 Hd-13041-12713	4765±85 4690±35 4670±35 4660±35	3641–3381 3519–3376 3516–3373 3511–3370	>3381 BC >3376 BC >3373 BC >3370 BC	Burmeister in press Bakker <i>et al.</i> 1999: 778, 780, tab. 1.
12	<b>Ġebel Arūda</b> Iraq Wheel model Late Uruk	Charcoal? Eroded burnt twigs probably from the roofs of houses above	GrN-7989 GrN-8463 GrN-8464	4495±35 4490±35 4410±80	3335–3103 3333–3101 3315–2916	>3103 BC >3101 BC >2916 BC	Burmeister in press Bakker <i>et al.</i> 1999: 778, 780, tab. 1.
13	<b>Arslantepe</b> Turkey Wheel model Early Bronze Age, Per. IVa	Charcoal? Filling of room A113	R-1474	4380±80	3264–2901	>2901	Alessio <i>et al.</i> 1983: 578; Bakker <i>et al.</i> 1999: 778, 780, tab. 1; Burmeister in press
14	<b>Warburg I</b> Germany Petroglyphs Wartberg culture	Human bones Burial layer	KN-4503	4376±36	3022-2922	>2922 BC	Raetzl-Fabian 2000: 170
15	<b>Lohne-Züschen I</b> Germany Gallery grave Petroglyphs Wartberg culture	<sup>14</sup> C date of a mixture of human and animal bones Burial layer	Hd-16972	4105±26	2840–2581	>2581 BC	Raetzl-Fabian 2000: 163; Burmeister in press

16	<b>Olzreute-Enzisholz 3</b> Germany Settlement Goldberg III culture	<sup>14</sup> C date, wood (Fagus)  tree-ring 7–17 tree-ring 98–100 Dendrodate, wood (Fagus)	 KIA34933 KIA34934	4335±18 4271±26 4147±31 4400±31 4245±32 2898.5±1.5	3008–2904 2906–2886 2866–2640 2900–2875 2900–2897	>2640  >2875  >2897	Bleicher 2009: 136, 219 Schlichtherle 2009, 2010     Schlichtherle <i>pers. comm.</i>
17	<b>Seekirch-Stockwiesen</b> Germany Wooden wheel Settlement Horgen culture	Wood  Wood, wobble-matching 3 <sup>14</sup> C dates	Hd14711 Hd14712 Hd14713 Hd14754 KIA28558 KIA28559 KIA28560	4340±45 4335±70 4300±50 4220±55 4396±26 4414±25 4243±26	3012–2904 3083–2890 3010–2881 2904–2698 2890–2875	>2698 BC  >2875 BC	Schlichtherle 2002: 12    Bleicher 2009: 88, 96, 191
18	<b>Alleshausen-Grundwiesen</b> Germany Wooden wheel Settlement	Wood  Tree, root above settlement layer = TAQ wobble-matching 3 <sup>14</sup> C dates	Hd14660 Hd15016 Hd14603 Hd14907 Hd15018 KIA28561 KIA28562 KIA28563	4275±50 4265±50 4195±30 4115±30 4086±18 4137±26 4418±24 4366±27	3008–2803 2925–2760 2883–2705 2855–2621 2832–2579 2865–2844	>2832 BC  >2844 BC	Schlichtherle 2002: 11    Bleicher 2009: 218
<b>Category B2: definite vehicles, no scientific dates</b>							
19	<b>Starokorsunskaya Mound 2, Grave 18</b> Russia Wooden wheels Majkop culture			>3370 BC			Maran 2004b: 436–8; Trivonof 2004: 169–72
20	<b>Koldyri Mound 14, Grave 7</b> Russia Wooden wheels Majkop culture			>3370 BC			Maran 2004b: 436–8; Trivonof 2004: 169–72
21	<b>Mari, Tell Hariri</b> Mesopotamia Bitumen imprint of 2 wheels			>2850 BC			Butterlin & Magueron 2006: 319

22	<b>Čšcho, Rsekujchabl'</b> Konstantinovskoe Ukraine Clay models from settlement layers Majkop culture			>3370 BC			Trivonof 2004: 169–72
23	<b>Novokorsunskaja 85, Mound 2, Grave 18</b> Ukraine Wooden wheel Majkop culture			>3370 BC			Gej 2004: 186
24	<b>Budakalász, Grave 177</b> Hungary Classical Baden culture Wagon-shaped pottery	Cenotaph	3350–2679	> 2679 BC			Maran 2004a: 270–72; Furholt 2009: 238–40; Siklósi 2009
25	<b>Szigetszentmárton, Grave 1</b> Hungary Classical Baden culture Wagon-shaped pottery		3350–2679	> 2679 BC			Maran 2004a: 270–72; Furholt 2009: 238–40
26	<b>Zurich-AKAD</b> Switzerland Settlement Wooden wheel	Find on top of Pfyn layer, probably related to early Horgen culture, underneath Corded Ware cultural layer	3430–3175	>2800 BC			Ruoff & Jacomet 2002
27	<b>Brad-Țeba</b> Romania Coțofeni culture Wheel model	House inventory	3500–3000	>3000 BC			Burmeister in press
28	<b>Stone heap graves</b> Denmark	No dates		>2700 BC			Johannsen & Laursen 2010
<b>Category C: hypothetical vehicles with quite old dates</b>							
29	<b>Budakalász, Grave 158</b> Hungary Classical Baden culture Wagon-shaped pottery	Human bone	VERA-3544	4170±40	2877–2679	>2679 BC	Maran 2004a: 270–72; Furholt 2009: 238–40; Siklósi 2009

30	<b>Budakalász, Grave 3 + 36</b> Hungary Box-shaped pottery Boleráz-Horizon	no dates			3650–3350	>3350 BC	Maran 2004a: 269–70
31	<b>Radošina</b> Hungary Boleráz-Horizon Box-shaped pottery with applications of cattle figurines				3650–3350	>3350 BC	Maran 2004a: 269–70; Furholt 2009: 238–40
32	<b>Boglárelle</b> Hungary Boleráz-Horizon Box-shaped pottery with probably broken applications of cattle figurines				3650–3350	>3350 BC	Maran 2004a: 269–70
33	<b>Balatonberény</b> Hungary Boleráz-Horizon Box-shaped pottery with holes for wheels?	Surface find			3650–3350	>3350 BC	Maran 2004a: 269–70
34a	<b>Harrapa, Ravi-layers</b> India Terracotta-fragment of wagon model ?	Hearth from house floor above, hearth 121–120 Charcoal		4990±40			Kenoyer 2004: 90–91
34b	<b>Harrapa, Ravi-layers</b> India Terracotta-fragment of wagon model ?	Hearth from house floor above, hearth 115–115 Charcoal		4980±60			Kenoyer 2004: 90–91
34c	<b>Harrapa, Ravi-layers</b> India Terracotta fragment of wagon model ?	Hearth from house floor below, 177–177 Charcoal		4320±50			Kenoyer 2004: 90–91

34d	<b>Harrapa, Ravi-layers</b> India Terracotta fragment of wagon model ?	Hearth from house floor below, 128–127 Charcoal		4210±50			Kenoyer 2004: 90–91
35	<b>Novoaleksandrovsij I, Mound 6, Grave 16</b> Ukraine Majkop culture Fragments of wood wheel?			>3370 BC			Gej 2004: 187
36	<b>Karolina, Nemirov, Racovec, Vladimirovka</b> Ukraine Clay models probably with possibility to fix wheels settlement layers Tripol'je BC–C1					>3500 BC	Maran 2004a: 236; Trivonof 2004: 169–72; Matuschick 2006: 280–82

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