4_9_1 Radiocarbon dating

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Ninety-five radiocarbon dates were obtained from the Nebelivka megasite during the course of the project. They are listed below (ADS LINK TO 4_9_2_DATE_LIST/4_9_2_AMS_datelist). Initial dates were obtained from the structures excavated in 2009. The majority of dates were obtained following a sampling strategy based on the geophysical plan of the site. The aim was to sample different sectors of the site, including the inner and outer circuits of houses and the inner radial streets.

Our sampling scheme was devised to answer four key questions about the chronology of Nebelivka:

(1) How long was the occupation of an individual segment of the inner or outer circuit?
(2) Were adjacent houses and segments constructed, occupied, and destroyed sequentially or coevally?
(3) How many segments/groups were constructed, occupied, and destroyed coevally across the whole site?; and
(4) How do the radial streets inside the circuits relate chronologically to the circuits?

The sampling strategy followed the apparent hierarchical spatial arrangement of houses. We aimed to sample houses from an inner circuit segment, from an outer circuit segment and from each of two groups inside the circuit to address the question of contemporaneity of houses within these groups, the duration of use of a segment/group, and whether the construction dates were spatially structured.

Sampling was planned to be by auger coring of *ploschadka* to obtain daub samples from which charred plant remains could be extracted for dating. As documented elsewhere (ADS LINK TO SECTION 4_8_1), the preservation of charred remains was poor, with 130 cores from 91 houses yielding just one charred grain. This approach was abandoned after one season. Instead, a programme of test-pit excavation was undertaken to recover stratigraphically reliable bone samples from houses (ADS LINK TO SECTION 5_3_1). Bone samples were screened for collagen preservation using overnight acid demineralisation of a chip of bone, and only those yielding visible collagen were considered for submission to the Oxford Radiocarbon Accelerator Unit. A grant-in-kind from the National Radiocarbon Facility funded 80 dates.

Bayesian modelling of the initial batches of dates indicated that the site was occupied only for a short period, and that this coincided with the wiggle in the radiocarbon calibration curve at c.4000-3700 BC. The final set of dates was therefore measured at higher precision in an attempt to resolve the chronology.

The stratigraphic sequence in each test-pit was similar, yielding the following numbers of dates: pre-construction (20 dates), house floor (23 dates), destruction deposits (30 dates), post-destruction (no dates), topsoil (1 date). Only seven houses had samples with stratigraphic ordering. Bayesian models were constructed to explore whether there was spatial structure to the dates.

The overall occupation of the site (Question 1) was estimated as starting in 3985-3880 BC (95.4%), ending 3855-3750 BC (95.4%) and lasting 45-225 years (95.4%).

Addressing Question 2, adjoining houses in three radial groups and four groups around the circuits were tested to see if there was a sequence along the segment. One radial group yielded weak evidence for an ordering from the centre outwards and one circuit group showed evidence for clockwise ordering. There is therefore either no such ordering or the chronological resolution is insufficient to detect it.

Question 4 was addressed using separate models to infer the start and end dates of the inner circuit, the outer circuit and the radical streets. The only event that was clearly different was that the end of the outer circuit was later than the other two groups. The start dates for the spatial components cannot be distinguished.

A series of additional models were constructed to explore other possible spatial and stratigraphic structures. Models that treat the five stratigraphic levels as coeval across the site proved not to be compatible with the data. Attempts to order the Quarters in time, or to model them as clockwise or anticlockwise sequences

failed to yield useful results. Where there are 'kinks' or breaks in the alignment of houses, no chronological breaks could be detected across them.