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## AN ATTEMPT OF RADIOCARBON DATING OF THE CONQUEST OF KIEV IN 1240 AD

**Summary.** The authors tried to determine radiocarbon dates of several artifacts from scientific collection of the historical museum in Kiev, associated with well known historical event of the conquest of Kiev in AD 1240 by the Mongol-Tartar hordes. Two pieces of wood and one piece of textile from two houses destroyed by the invaders were used for radiocarbon dating. The results after calibration of the radiocarbon time scale agree fairly well with the historical date of conquest.

## PRÓBA DATOWANIA METODĄ RADIOWĘGLA ZDOBYCIA KIJOWA W 1240 ROKU AD

**Streszczenie.** Autorzy podjęli próbę określenia wieku radiowęglowego kilku użytkowych przedmiotów ze zbiorów muzealnych, wiązanych z historycznym zdarzeniem najazdu i zdobycia Kijowa przez Tatarów w roku 1240 AD. Datowaniu podlegały dwa fragmenty drewna oraz tkanina z dwóch spalonych domostw. Wyniki datowań po zastosowaniu kalibracji wykazują doskonałą zgodność ze znaną datą historyczną.

### 1. Introduction

The National Museum of Ukrainian History (NMUH) in Kiev has a rich archeological collection from excavations conducted in historical sites of Kiev. In the Kiev Rus exposition section there is a complex of XII-XIIIth centuries things from dwelling-workshops of Kiev upper-town. The construction, which had been investigated in 1938 year at the territory of St. Michael's Monastery of the Golden Domes is known as „dwelling of artist”

or „house of artist”. In this locality, just below the destruction horizon, consisting of upper part of the house and made of burned clay and carbonized wood the excavators have found the set of iron tools for wooden working-up accompanied with 14 small vessels made of baked clay with remains of paint, bronze lamp, pieces of wooden dishes (bowls, spones), and approximately 600 gramms of Dniپر amber as well as other artifacts. This unusual list of archeological findings allows to us to conclude that the excavated house was an artist handi-craft (Karger, 1957).

During excavations on Bolshay Gytomirskay street No. 4, which have been undertaken in 1946 another interesting site called „blacksmith's dwelling” or „blacksmith house” was investigated. The whole area of it had been blocked up with burnt fragments of wooden parts of house construction. Under the destruction level at depth 1.5 m below contemporary surface the excavators have found plenty of iron objects (scythes, sickles, padlocks, balances, axes and so on) and large number of ferrigenous slags and other metal artifacts, as well as numerous animal and fish bones. All findings were dated archaeologically to XII–XIII centuries AD. In the overlying cultural layers the excavators did not found any traces of artifacts from XIV–XVI centuries. It may be therefore reasonably assumed that this region was not reconstructed and remained inhabited for a long time.

## 2. Material and methods

Three samples were selected for radiocarbon dating from aruple collection gathed at The National Museum of Ukrainian History (NMUI) in Kiev. One sample of wood, forming a part of woodem spoon, was selected to date the artist house. Two samples were selected from rich set of artifacts found in the blacksmith house, the first sample was piece of textile and the second was fragment of wooden barrel. Because of very small size of the samples available for age determinations a new technology developed specially for treatment of small samples was applied (Skripkin V., Kovaliukh N., 1995). The samples after standard chemical pretreatment were converted to benzene and counted using QUANTULUS 1220 liquid scintillation beta spectrometer.

## 3. Results and discussion

Results are listed in Table 1 in form of conventional radiocarbon dates in years BP accompanied by calibrated radiocarbon dates in years AD. Calculations of calibrated ages was made using the computer procedure developed in the Gliwice Radiocarbon Laboratory

(Pazdur M.F., Michczyńska D.J., 1989). The age intervals quoted in /parentheses are 68% confidence intervals (ie. the uncertainty intervals corresponding to the 1-sigma errors). Results of radiocarbon dating in calendric time scale are shown in form of bar plot in Figure 1. The values of median of the calibrated ages of individual samples, listed in Table 1 and indicated by crosses in Figure 1, are by 40 years younger than known historical date of Kiev conquest. It should be noted that the 1-sigma intervals of calibrated ages, listed in Table 1, and shown as bold lines in Fig. 1, include the historical date of AD 1240.

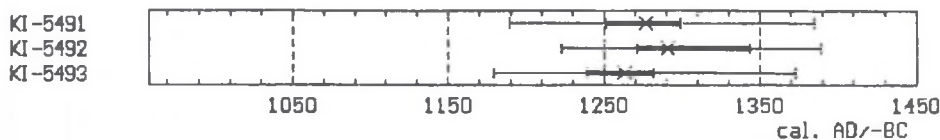


Fig. 1. Calibrated radiocarbon dates. Explanations: x- medial, bold line - 68% confidence interval (1sigma erro), normal line - 95% confidence interval (2sigma error)

Rys. 1. Kalibrowane daty radiowęglowe. Objaśnienia: x- mediana, linia pogrubiona - przedział ufności 68% (przedział błęd 1 sigma), linia normalna - przedział ufności 95% (przedział błęd 2 sigma)

For more detailed analysis of the problem of relation between calibrated radiocarbon dates and the historical date of the Kiev conquest, in Figures 2, 3 and 4 are given full details of calibration performed for each individual sample. Probability distributions of calendric ages of all investigated samples are very similar and consist of the main peak (with maximum at AD 1284, AD 1288 or AD 1280, respectively; cf captions to Figures 2, 3 and 4) ranging between AD 1200 and AD 1300, and the secondary smaller peak with maximum at AD 1370. It may be therefore concluded that the results of radiocarbon dating agree with the hypothesis that the destruction of the two investigated houses took place during the Kiev conquest in AD 1240. A shift of mean values of calendric dates of investigated samples with respect to the historical date of the Kiev conquest is lower than the laboratory error of age determination and may be caused by several sources of errors of both laboratory and extralaboratory origin. One of the possible sources may be contamination of samples with recent organic carbon during excavations or storage in the museum collection.

Investigated materials helped us to realise the connection between destruction of the mentioned dwellings and tragic events of Kiev's rout by the Mongol-Tatars hordes on December 6th of AD 1240. Finds, which have been discovered during excavations undertaken and directed by M. K. Karger in 1939 in hiding-place, located under foundations of the Church of the Tithes, belong undoubtedly to that time. In this locality at depth 4.6 m the excavators have found weapons (rests of spades and pails) as well as decorations, frag-

Table 1

Results of radiocarbon dating				
Locality	Sample	Lab.No.	Age BP	Calibrated age AD
Artist's house	wood	KI-5491	740 ± 60	1280 (1240-1340)
Blacksmith's house	textile	KI-5492	720 ± 55	1290 (1260-1360)
Blacksmith's house	wood	KI-5493	760 ± 55	1280 (1230-1290)

ments of burnt cloth, moulds and remains of city defenders, who tried to exit from range of surrender through the underground passage. View of tragic death of people, exhumed from this hiding-place is the most bright illustration to passage in chronicles about last hours of the defence of the ancient Kiev.

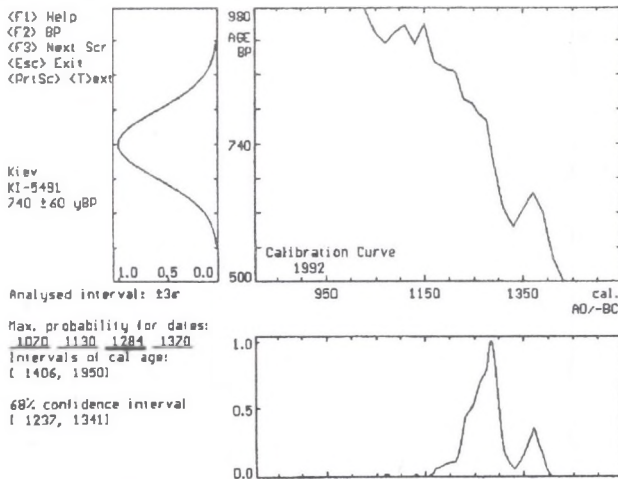


Fig. 2. Result of probabilistic calibration of radiocarbon date obtained on sample of wood (fragment of wooden spoon) from artist's house (KI-5491). Maximum of the probability distribution of calendric age, shown in lower part of the figure, occurs at AD 1284. The shape of the relevant part of the calibration curve used for calculations is shown in upper part of figure

Rys. 2. Pełny wydruk wyników obliczeń kalibracyjnych dla próbki drewna (fragment drewnianej łyżki) z domu artysty (Ki-5493). Maksimum rozkładu prawdopodobieństwa wieku kalendarzowego, pokazanego w dolnej części rysunku, przypada na rok 1284 AD. W górnej części rysunku pokazano kształt odpowiedniego fragmentu krzywej kalibracyjnej użytej w obliczeniach kalibracyjnych

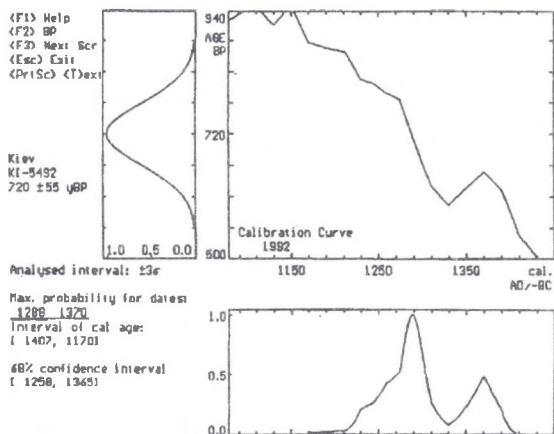


Fig. 3. Result of probabilistic calibration of radiocarbon date obtained on sample of textile from blacksmith's house (KI-5492). Maximum of the probability distribution of calendric age occurs at AD 1288

Rys. 3. Pełny wydruk wyników obliczeń kalibracyjnych dla próbki tkaniny z domu kowala (KI-5492). Maksimum rozkładu prawdopodobieństwa wieku kalendarzowego przypada na rok 1288 AD

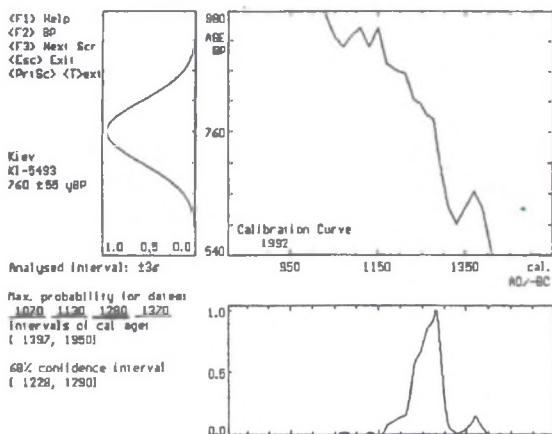


Fig. 4. Result of probabilistic calibration of radiocarbon date obtained on sample of wood from blacksmith's house (KI-5493). Maximum of the probability distribution of calendric age occurs at AD 1280

Rys. 4. Pełny wydruk wyników obliczeń kalibracyjnych dla próbki drewna z domu kowala (KI-5493). Maksimum rozkładu prawdopodobieństwa wieku kalendarzowego przypada na rok 1280 AD

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## Streszczenie

Autorzy podjęli próbę określenia wieku radiowęglowego kilku zabytkowych przedmiotów ze zbiorów Narodowego Muzeum Historycznego Ukrainy w Kijowie, związanych z historycznym zdarzeniem najazdu i zdobycia Kijowa przez Tatarów w roku 1240 AD. Datowaniu podlegały dwa obiekty, na których prace wykopaliskowe prowadził M. K. Karger, tzw. „dom artysty” oraz „dom kowala”, nazwane tak od bogatego i dobrze zachowanego inwentarza zabytków, charakterystycznego dla wymienionych profesji. Z „domu artysty” datowaniu podlegała próbka drewna stanowiąca fragment drewnianej łyżki, z „domu kowala” datowano dwie próbki – fragment stosunkowo dobrze zachowanej tkaniny oraz fragment drewna z beczki. Pomiary wieku wykonane zostały metodą ciekłych scyntylatorów przy użyciu spektrometru scyntylacyjnego QUANTULUS 1220. Do przygotowania preparatów pomiarowych w postaci benzenu zastosowano specjalną technologię opracowaną w kijowskim laboratorium radiowęglowym przez V. V. Skripkina, pozwalającą na przetworzenie bardzo małych próbek organicznych do postaci benzenu z wysoką wydajnością i bez zauważalnego frakcjonowania izotopowego. Wyniki datowań po zastosowaniu kalibracji wykazują dobrą zgodność ze znaną datą historyczną i stanowią potwierdzenie przypuszczenia, że zniszczenie przebadanych domostw związane było z najazdem tatarskim 1240 roku.