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NICHE BURIALS OF THE CORDED WARE CULTURE AT KRAKÓW-MISTRZEJOWICE, SITE 85

ABSTRACT

Jarosz P., Koszowska E., Ostrowski M. and Szczepanek A. 2015. Niche burials of the Corded Ware Culture at Kraków-Mistrzejowice, site 85. *Sprawozdania Archeologiczne* 67, 165–187.

Two additional niche graves of the Corded Ware Culture were discovered during the rescue archaeological works carried out in the year 2010 on site No 85 in Kraków-Mistrzejowice.

The preserved fragments of skeletons allow to assess that in the feature 1307 there were buried two individuals: female at the age of death at *iuvenis-adultus* and child at the age of death at *infans II*, the sex was not established. The human remains that were found in the feature 1311 belonged to a man at the age at death of *adultus* (20–25 years old) with intra vitam body height of 170 cm. Discovered in grave goods especially pottery allow to date them to phase IIIb of the Corded Ware Culture development in Małopolska Upland.

Keywords: Corded Ware culture, late Neolithic, Małopolska, niche graves, anthropological analysis, chemical composition

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INTRODUCTION

Season 2010–2011 introduced a new stage in the excavation of site 85 at Kraków-Mistrzejowice, necessitated by a project of housing estate expansion estate (Fig. 1). The fieldwork, directed by co-author M. Ostrowski, was carried out on the slope of an elevation which descends gently eastward to the valley of the Dłubnia River. Some 60 acres were investigated, revealing abundant relics of Neolithic occupation identified as Linear Pottery, Malice, Funnel Beaker, Baden, Corded Ware cultures. Archaeological trenches investigated only individual plots of the future residential buildings (Fig. 2:A). Prior to starting the fieldwork the site had already suffered heavy damage, stripped of its topsoil.

Two graves of Corded Ware Culture (subsequently: CWC) discussed in this paper were unearthed in one of the southern trenches (residential building 8 — Fig. 2:A, B). The features were situated on the slope of the elevation, some 5 meters apart, at a distance of respectively, *ca* 100 and *ca* 120 metres to the south-east of CWC graves identified during the 2008 research (Jarosz, Mianowska 2011).

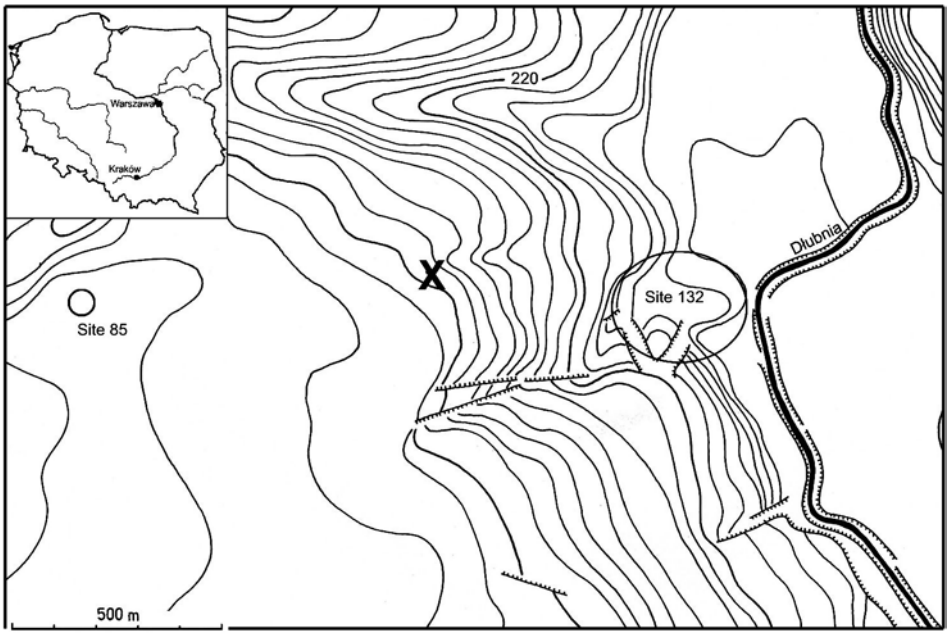

Fig. 1. Location of the burial ground of CWC in Kraków-Mistrzejowice, Site 85, Krakow district.
x — location of the Site

Fig. 2. Kraków-Mistrzejowice, Site 85. 1 — Plan of the South part of the Site, a — area excavated in 2008, b — area excavated in the years 2010–2011, c — graves of CWC; 2 — part of the site with CWC niche burials, a — CWC burials, b — other archaeological features

LIST OF FEATURES

Feature 1307

A niche grave. At the level of detection, documented only as an outline of a niche feature and a passage leading to it from the East (Fig. 3). The entrance to the niche was over a steep, 85 cm ledge. The fill consisted of three deposits: brown, brown-yellow and yellow. The backfill yielded a small number of chronologically older artefacts which presumably entered the niche as it filled up. Near to the bottom of the niche its shape was sub-oval, observably flattened on the side of the entrance passage. The niche had maximum dimensions of 240 x 170 cm and its major axis oriented N-S (Fig. 3). At its bottom was a small

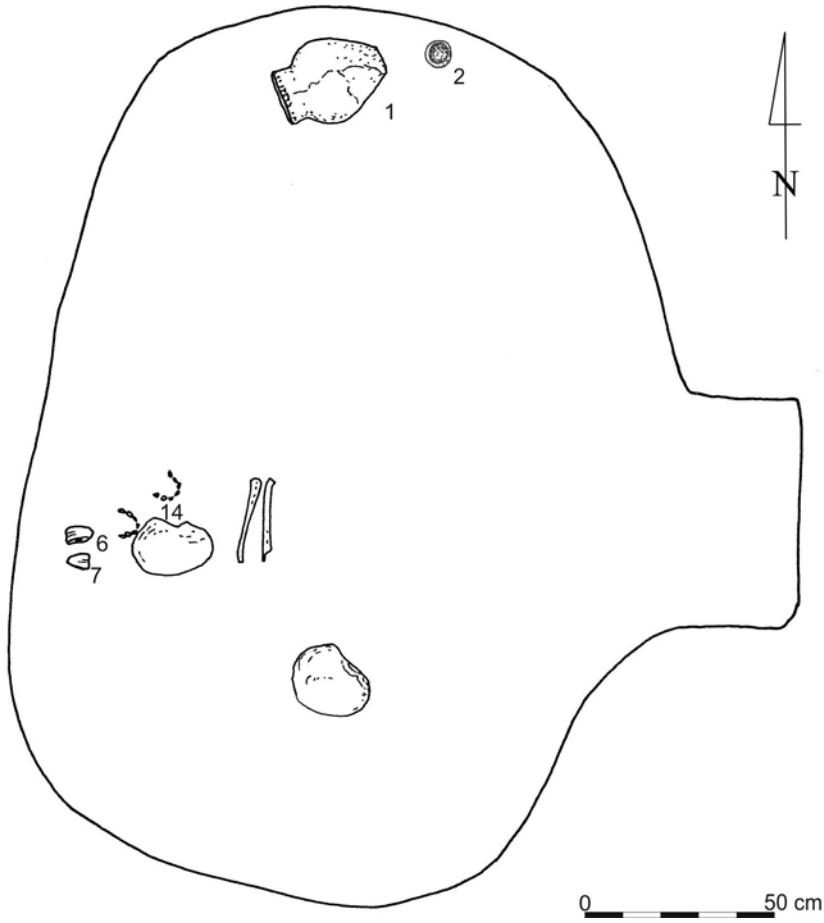

Fig. 3. Kraków-Mistrzejowice, Site 85. Plan of the feature No. 1307

number of skeletal fragments of two individuals: a young female (*iuvenis/adultus*) and a child (*infans II*). A fragment of the woman's cranial vault discovered in the S area of the tomb was resting on its right side, with the "face" to the East. To the north of it were damaged shafts of long bones of that individual. At the back of the niche, also in its S area, was a fragment of a cranial vault of the child, also resting on its right side, with the "face" towards the niche entrance (E). Grave goods discovered next to the skeletal remains included a copper wire spiral found resting on the temporal bone of the child (Fig. 5:14) and, about 30 cm to the west of the child's cranium, a flint axe (Fig. 5:7), a small stone battle-axe (Fig. 5:6) and some flint tools and flakes (Fig. 4:8, 9). A bone pendant was found in the area between the two crania (Fig. 5:3). More grave goods: two vessels (fig 4:1, 5:1), two eroded bone chisels (Fig. 5:4, 5), flint tools and flakes (Fig. 4:12, 13), were discovered in a cluster in N area of the niche.

Inventory

1. Jar-shaped vessel (Fig. 4:1) with a distinct, cylindrical neck, lightly flaring rim and a small, rounded ledge. Rounded body, with maximum circumference immediately above mid-height. Poorly defined, flat base. Below the rim, two short cordons provided with 6 bosses and a row of triangular impressions. External surface floury, red to dark brown, internal surface gray-orange to black, in section dark gray. Clay with inclusions of sand, fine grains of mica and grog. Dimensions: height 26.2 cm, rim diameter 15.1 cm, body diameter 22.1 cm, base diameter 7.1 cm, wall thickness 7 mm.

2. Beaker with a distinct, conical neck and lightly flaring rim (Fig. 5:2). Maximum body circumference at mid-height. Poorly defined, flat base. On the vessel neck, 10 horizontal bands of impressions made with a fine, twisted cord, S-twist (thickness — 1.5 mm). External and internal surfaces and section dark gray to black. Clay with inclusions of fine-grained crushed rock, mica and sand. Dimensions: height 11.3 cm, rim diameter 9.3 cm, body diameter 9.2 cm, base diameter 5.6 mm, wall thickness 5 mm.

3. Animal bone pendant with eroded surfaces and drilled perforation at its wider point (Fig. 5:3). Dimensions: length 38 mm, width 15 mm, thickness 5 mm, perforation diameter 4 mm.

4. Fragment of awl shank with fractured upper end (Fig. 5:4), cross-section in the shape of the letter "C", made from a sheep/goat radial bone. The bone was split lengthwise from its distal end. Dimensions: length 140 mm, width at base 15 mm, thickness 7 mm.

5. Upper fragment of an awl (Fig. 5:5), cross-section in the shape of the letter "C", made from a sheep/goat radial bone. Dimensions: length 54 mm.

6. Stone battle-axe (Fig. 5:6) made from igneous rock similar to gabbro, pentagonal in outline, edges rounded. Cutting edge lightly asymmetrical. Some places on the butt damaged. Dimensions: length 8.5 cm, width 4.1 cm, width of cutting edge 4.8 cm, width of butt 2.4 cm, height of butt 3.8 cm, diameter of hole 1.8 cm.

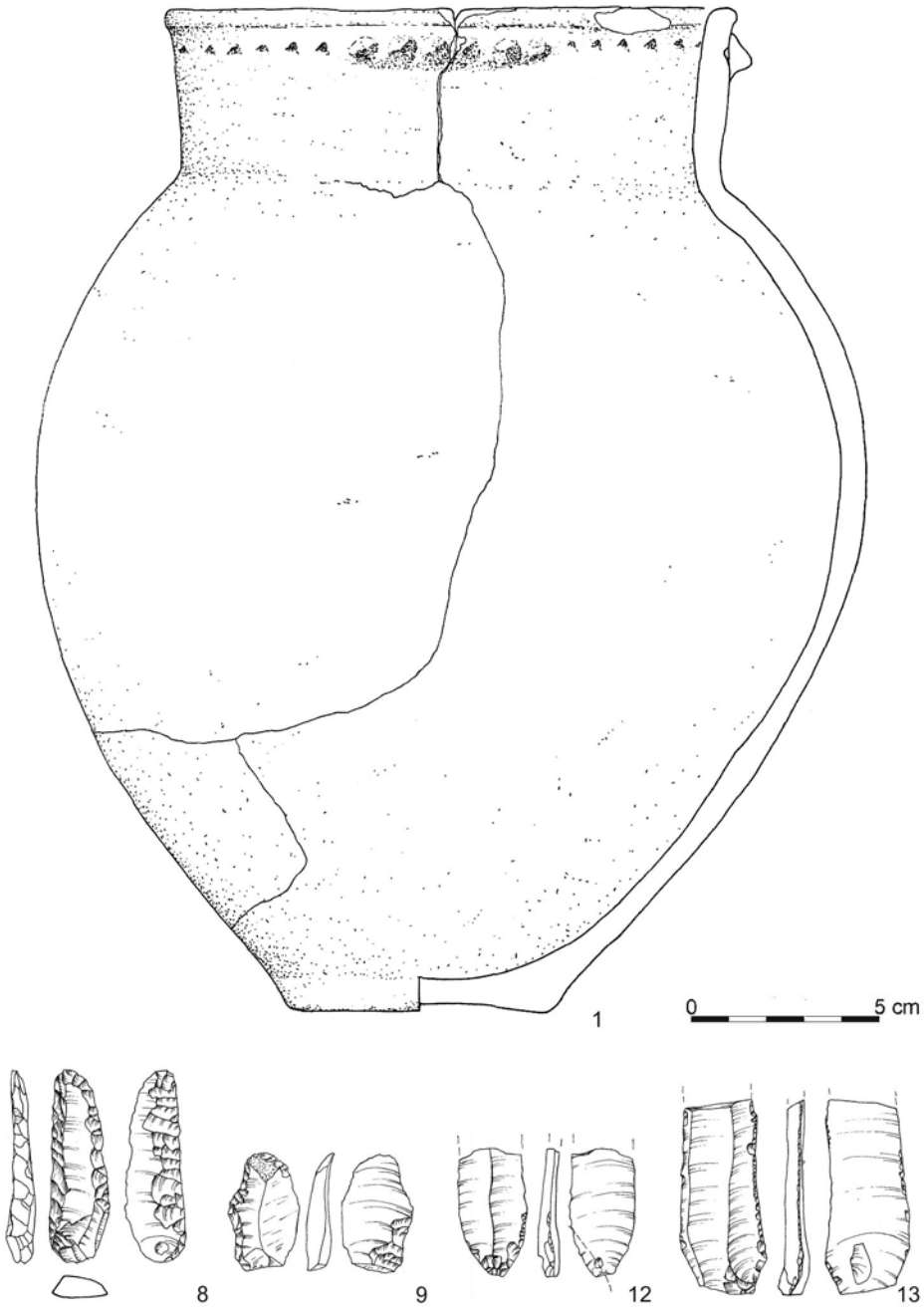

Fig. 4. Kraków-Mistrzejowice, Site 85. Feature No. 1307. Inventory of the burial

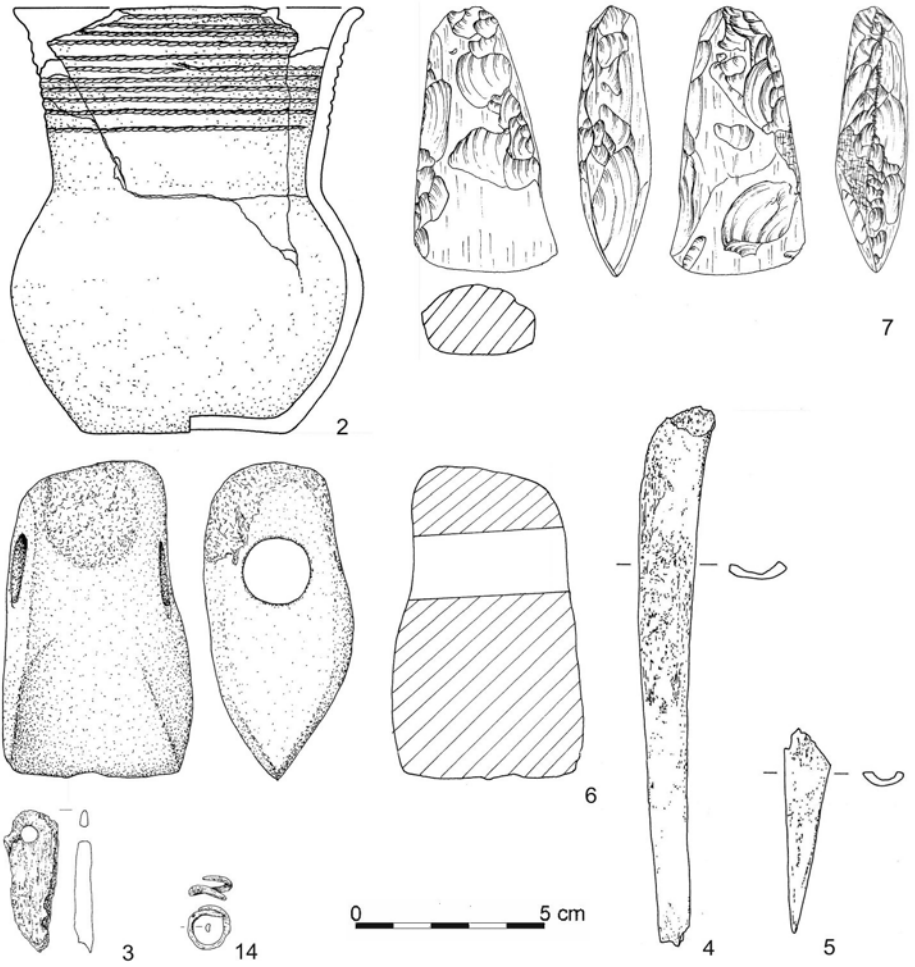

Fig. 5. Kraków-Mistrzejowice, Site 85. Feature No. 1307. Inventory of the burial

7. Axe of irregular cross-section made of Świeciechów flint (Fig. 5:7). Marks from grinding visible on the frontal surfaces (especially in the area near the cutting edge) and on lateral surfaces. On one lateral edge, marks of battering which produced a three-walled cross-section in some parts of the axe. Butt irregular, cutting edge lightly asymmetrical. Dimensions: length 69 mm, thickness 19 mm, width of cutting edge 36 mm, width of butt 14 mm, thickness of butt 13 mm.

8. Retouched blade — a "dagger" form made of Jurassic flint from the Kraków region (Fig. 4:8). Dorsal face with retouch on lateral edges and distal end. Abrupt and semi-

abrupt retouch. Ventral face with, on one of the edges, low-angle retouch extending to the middle of the blade. Dimensions: 31 x 19 x 6 mm.

9. Flake made of Jurassic flint from the Kraków region; on dorsal face, retouch of one of the edges and near the distal (Fig. 4:9). On ventral face, retouch near the platform. Corticated near the distal. Dimensions: 51 x 6 x 8 mm.

10. Flake made of Jurassic flint from the Kraków region. Dimensions: 34 x 20 x 5 mm.

11. Flake made of Jurassic flint from the Kraków region. Dimensions: 39 x 25 x 9 mm.

12. Flake made of Jurassic flint from the Kraków region. Dimensions: 44 x 25 x 8 mm.

13. Fragment of blade made of Jurassic flint from the Kraków region; near the platform, obverse retouch of sides (Fig. 4:12). Dimensions: 34 x 18 x 5 mm.

14. Fragment of a blade made of Jurassic flint from the Kraków region (Fig. 4:13) with obverse retouch of sides. Single retouch detachments on the ventral face. Dimensions: 51 x 23 x 7 mm.

15. Flake made of Jurassic flint. Dimensions: 39 x 25 x 9 mm.

16. Small spiral of copper wire, plano-convex in section, folded into a 1.5 coil (Fig. 4:14). Tapering terminals. Dimensions: diameter of spiral: 13 mm, width of wire 2 mm.

Physical anthropology analysis

The skeletal remains submitted for analysis belong to two individuals. No articulated bones observed at the time of exploration.

Individual I

The surviving left fragment of the cranial vault has secondary damage to the *squama temporalis*. The cranium is gracile, with a vertically set forehead and moderately pronounced supraorbital ridges, sharp left suprarobital margin, small mastoid process, rounded *squama occipitalis*, moderately pronounced external occipital protuberance. Cranial sutures are open. The surviving left fragment of the mandible retains the mental foramen. The following permanent maxillary and mandibular teeth are present:

M3	M2	M1	C	I1								
car		M1			I2	C	P1	P2	car	M2	car	

The teeth display only moderate abrasion, calculus deposits are visible on the surface of the crowns. Carious lesions on occlusal surfaces of mandibular third molars (Fig. 6: a, b). Crown of mandibular first left molar fully destroyed by caries, with additionally, bone loss at the tooth root from dentoalveolar abscess (Fig. 6: c).

Bones of postcranial skeleton represented by partly damaged right clavicle and fragments of shafts: humerus, ulna, tibia. A small number of fragments of ribs, middle phalanx and wrist bones: triquetral, scaphoid and hamate bone. Ulnar epiphysis unfused.

Bone structure gracile, the presence of an unfused distal ulnar epiphysis indicates age group classification at death as *iuvenis/adultus* (*ca* 18–20 years old; White, Folkens, 2005, 372, Fig. 19:5), sex was determined from dimorphic traits as female.

Individual II

The only surviving bone is a left fragment of a gracile cranial vault. In the area of the mastoid process green stain from copper compounds. Found near to the cranium were fragments of maxilla and mandible with deciduous teeth and tooth buds of permanent teeth:

		P2		C					C		P2		M2
			P1		I2	I1	I1	I2			m2	M1	
	M1	m2	P1	C	I2	I1	I1	I2	C	P1	m2	M1	
M2													

Calculus on the teeth crowns. Dental development status indicates age group classification at death as *infans* II (10–11 years old; AlQahtani *et al.* 2010), no sex determination.

Study of the chemical composition of the copper wire spiral

The copper wire spiral is substantially corroded, with a thick coat of patina ranging in colour from turquoise-blue, through greenish-blue, to — in places — emerald or brownish green. Generally, the dominant colouration is blue — turquoise (Fig. 7:1).

The patina has two recognizable layers (Fig. 7:1a–b; 7:2). The outer layer, in some places overgrown with minute soil particles, is quite brittle, fine-grained, porous, easily exfoliated. Colour range is pale green, through turquoise-green, to brownish green; thickness is in the range of 0.5–1 mm (Fig 7:1a). Constituent mineral phases are fine-grained, opaque. Immediately below the outer layer occurs a thin, black-gray layer, with occasional aggregations of red colour (Fig. 7:1, 2). The inner layer of the patina adheres closely to the unchanged copper wire and is built of vitreous, mostly transparent, round and botryoidal forms, turquoise-blue in colour (Fig. 7:2).

Observation of the surface of the investigated object was made first, using NIKON binocular microscope and next, with a Hitachi S-4700 field emission scanning electron microscope. Images of the surface were recorded using a secondary electrons (SE) and a backscattered electrons (BSE) beam. Chemical composition in the area subjected to analysis was determined using an energy dispersive spectrometer (EDS) — a Noran Vantage system equipped with the scanning electron microscope in the Laboratory of Field Emission Scanning Electron Microscopy and Microanalysis at the Institute of Geological Sciences, Jagiellonian University. Values obtained for individual elements, according to the "stan-

dardless" procedure of calculation (i.e. using standards from the software library supplied by the manufacturer) the data were normalised to 100 weight percentage. Analyses were made at points and areas a few dozen square μm in size.

The error margin value (in wt%) was as follows: Ca (0.1), Si (0.06), Fe (0.1), Mn (0.1), Al (0.06), Cl (0.03), Cu (0.5), Sn (0.3), Sb (0.3), As (0.6), Pb (0.8), Ni (0.1), Co (0.1), Ag (0.2), Au (0.5), Bi (0.7), Cd (0.2). The detected oxygen content documented the presence of phases at a varying level of oxidation and was used in assessing the progress of the oxidation process.

Because of the archaeological value of the investigated artefact very small fragments (several mg) of the separated patina were sampled for analysis. All samples were scattered with graphite, consequently the C content was disregarded in the calculation.

A series of point analyses made for each layer of the patina revealed it to be far from uniform in mineral composition; this is confirmed by the variation in colour and morphology on the one hand, on the other, by substantial variation of the chemical composition. Basing on analysis results we can conclude that the dominant phases in the patina are Cu-Ca phosphates (Fig 8:1), copper phosphates, carbonates and oxides (Fig 8:2).

Table 1. Copper wire spiral from grave 1307, chemical composition of copper oxides (in wt%)

	3a	3b	3c	3d	8c	24c	25a
O	5.98	6.63	8.07	7.71	10.74	9.97	5.17
Al	0.11	0.22	0.22	0.20	0.09	0.14	0.07
Si	0.05	0.10	0.09	0.25	0.03	0.10	0.08
P	0.14	0.16	0.21	0.16	0.30	0.19	0.14
Cl	0.92	0.58	1.09	0.47	0.93	0.86	0.80
Ca	0.03	0.00	0.00	0.03	0.06	0.00	0.03
Cr	0.12	0.01	0.04	0.00	0.07	0.01	0.02
Mn	0.01	0.00	0.00	0.14	0.00	0.08	0.08
Fe	0.08	0.00	0.00	0.00	0.00	0.09	0.00
Co	0.00	0.00	0.02	0.00	0.11	0.00	0.06
Ni	0.00	0.14	0.00	0.09	0.09	0.00	0.28
Cu	91.60	91.99	89.34	90.63	86.66	86.23	91.78
Zn	0.00	0.00	0.00	0.00	0.00	0.00	0.00
As	0.00	0.00	0.30	0.00	0.18	0.00	0.27
Ag	0.26	0.14	0.43	0.06	0.25	0.40	0.00
Cd	0.00		0.08	0.00	0.26	0.07	0.42
Sn	0.00	0.03	0.11	0.00	0.00	0.00	0.18
Sb	0.34	0.00	0.00	0.00	0.23	0.35	0.12
Au	0.36	0.00	0.00	0.25	0.00	1.50	0.00
Pb	0.00	0.00	0.00	0.00	0.00	0.00	0.51
suma	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 2. Copper wire spiral from grave 1307, chemical composition of native Ag, variously oxidized (in wt%)

	22a	22b	24e	25b
O	5.22	2.97	12.63	4.05
Al	0.07	0.11	0.18	0.01
Si	0.27	0.17	0.10	0.17
P	0.05	0.09	0.24	0.30
Ca	0.39	0.19	0.19	0.25
Mn	0.15	0.00	0.09	0.00
Fe	0.15	0.00	0.00	0.00
Co	0.00	0.00	0.00	0.13
Ni	0.00	0.00	0.22	0.09
Cu	14.46	6.11	12.93	7.69
Zn	0.00	0.06	0.64	0.00
As	0.67	0.00	0.00	0.00
Ag	73.37	88.98	70.35	85.31
Cd	2.57	0.41	0.73	0.57
Sn	0.31	0.00	0.00	0.00
Sb	1.56	0.00	0.94	0.13
Au	0.76	0.91	0.25	0.79
Pb	0.00	0.00	0.50	0.50
suma	100.00	100.00	100.00	100.00

An appreciable amount of silica detected in the outer layer of patina suggests either the presence of e.g., chrysocolla, or clay minerals. The high concentrations of calcium and of phosphorus originate from the proximity of human bone in the grave. Analyses of chemical composition alone do not permit a closer mineral identification of the phosphate phases in the patina; they shall be the focus of a separate study following some detailed spectroscopy analyses.

When a fragment of the copper wire became detached during the investigation an attempt was made to determine the composition of the copper at the place of fracture. Unfortunately, no unaltered copper was detected. The minute phases a few microns in size which displayed a metallic lustre observed under the binocular microscope, potentially uncorroded copper wire, were examined with the scanning electron microscope and identified in fact as the mineral phase of metallic elements: Ag, Bi, Sb and Pb. Presumably, the wire had broken where the copper was most seriously "corroded". Fragments with unaltered copper could still survive where the patina is of the smallest thickness but reaching them would cause major damage to the artefact without the assurance of success.

The phases identified, where Oxygen:Copper ratio is the lowest, are copper oxides. They occur in the form of aggregations with a length of up to 300 μm and a width of *ca*

100 μm, and consist of euhedral and subhedral crystals up to several μm in size. The oxygen content and the morphological forms of the phases, mostly octahedron, much more rarely, a combination of an octahedron with a rhombic dodecahedron, representative for a cubic system, indicate on Cu_2O cuprite (Fig. 8:2). Apart from Cu, this mineral contains small admixtures of Cl (0.6–1.1 wt%,) Ag (max. 0.4 wt%) and minor quantities of Ca, Si, P, none of them above 0.3 wt%. The content of metallic elements — Ni, Cd, Sb and Pb — is uneven, in a few analyses on a level of a decimal value of wt%, in the rest, often at the margin or below the margin of error (Tab. 1).

Among the identified phases, up to several μm in size, disseminated on the surface of the phosphate patina, most dominant are Ag minerals, mostly represented by native silver and silver sulphides, variously oxidized. In both types of phases there is a significant content of Cu admixture, from 5.9 to 17.7 wt%. Values for other elements are as follows: Au (0.3–1.0 wt%.) Cd (0.4–2.6 wt%) and Sb (max. 1.6 wt%). Other metallic elements — Co, Ni, Zn, Sn, and As — were detected only in a small number of analyses (Tab. 2, 3).

Often, next to Ag phases irregular aggregations of tabular crystals a few μm in size were detected, which contain Sb (33.0–48.1 wt%), Bi (9.0–25.5 wt%) and Pb (4.5–25.5 wt%) as

Table 3. Copper wire spiral from grave 1307, chemical composition of silver sulphides, partly oxidized (in wt%)

	20a	**21a**
O	7.18	3.52
Si	2.13	0.53
P	0.55	
S	9.57	10.27
Cl	0.13	0.51
Ca	0.73	0.75
Fe	0.14	0.00
Co	0.00	0.09
Ni	0.17	0.11
Cu	17.68	5.92
Zn	0.00	0.00
As	0.00	0.00
Ag	58.82	76.10
Cd	0.57	0.93
Sn	0.75	0.00
Sb	0.78	0.27
Au	0.42	0.99
Pb	0.39	0.00
suma	100.00	100.00

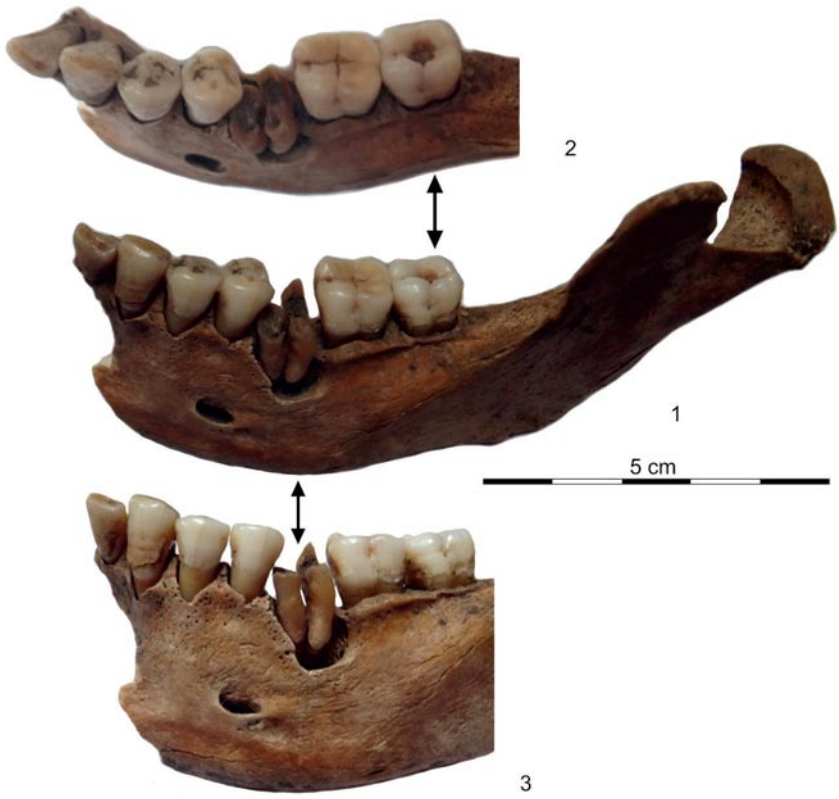

Fig. 6. Kraków-Mistrzejowice, Site 85. Feature No. 1307. Female individual, left part of the mandible

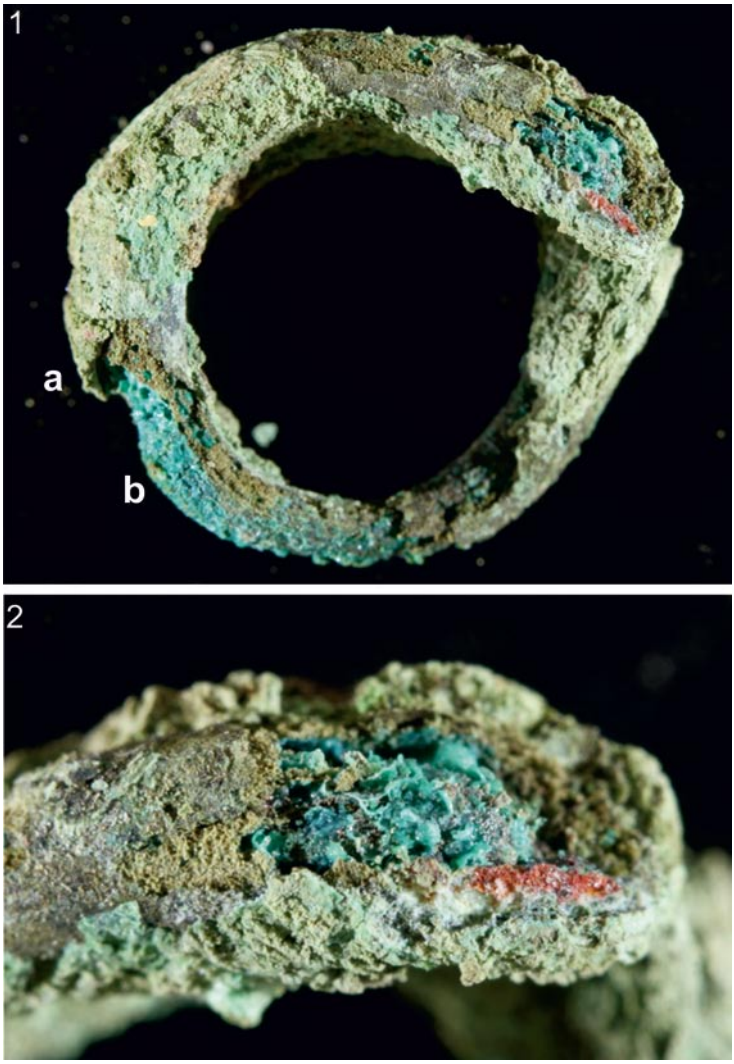

Fig. 7. Kraków-Mistrzejowice, Site 85, Feature No. 1307. 1 — the substantially corroded copper wire spiral with several visible layers of patina. The outer layer of patina greenish-blue in colour, fine-grained, opaque, easily exfoliated (a). The inner layer turquoise-blue, transparent, botryoidal in form (b). 2 — the fragment of the spiral wire with fine visible inner layer, turquoise-blue. Visible occasional aggregations of Cu oxide — cuprite Cu_2O, red in colour

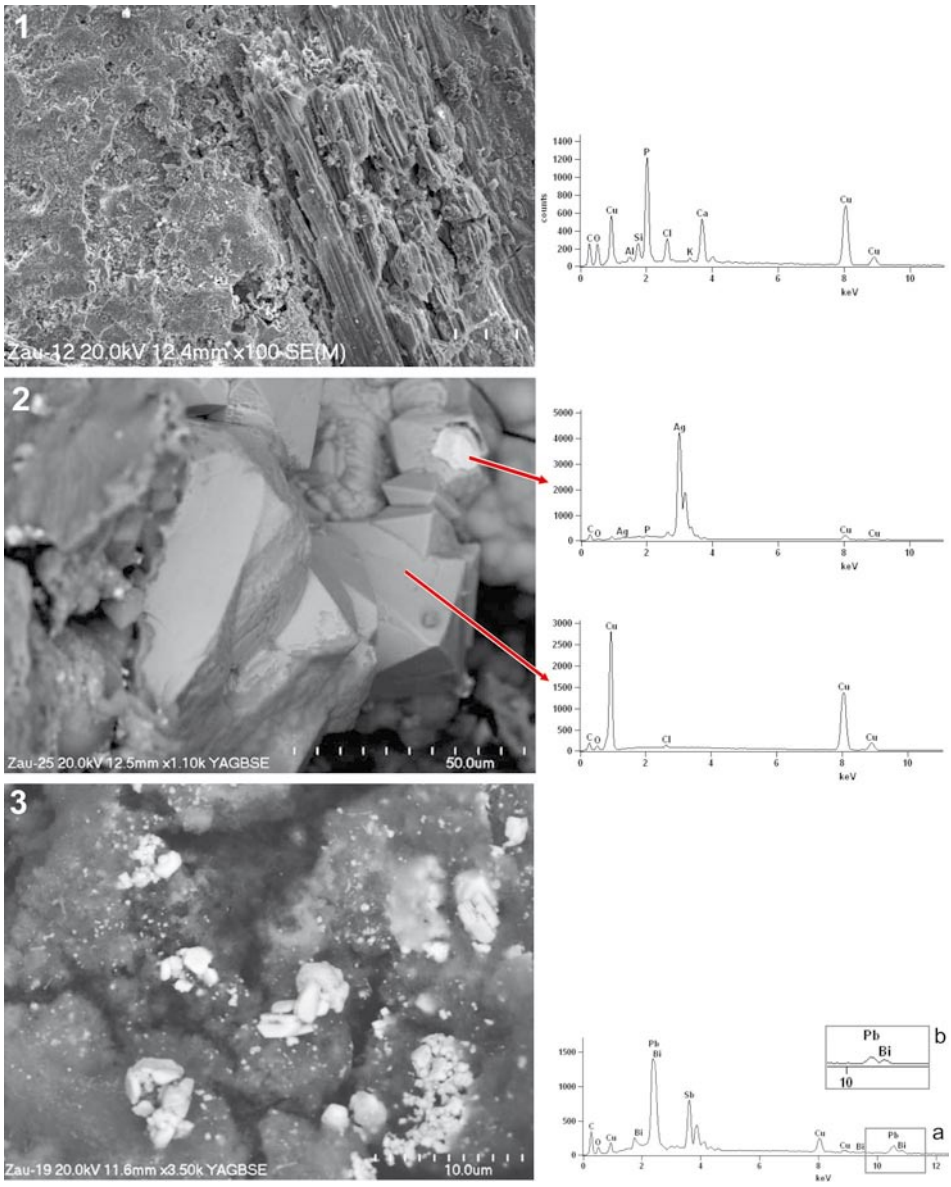

Fig. 8. Kraków-Mistrzejowice, Site 85, Feature No. 1307. 1 — the fragment of the patina composed of Cu-Ca phosphates, SEM. Next to EDS spectrum, 2 — the hipidimorphic crystals of cuprite (octahedrons). In one of them visible small crystal grain of Ag phase, BSE. EDS spectra of every phases, 3 — Tabular shaped crystal grains Sb-Bi-Pb phases (white) scattered on the surface of the phosphate patina (grey), BSE. EDS spectrum one of the phase (a). Part of the second spectrum shows other proportions of Bi and Pb (b)

Fig. 11. Kraków-Mistrzejowice, Site 85. Feature No. 1311. Clavicles, the arrow indicates the site of attachment of costoclavicular ligament

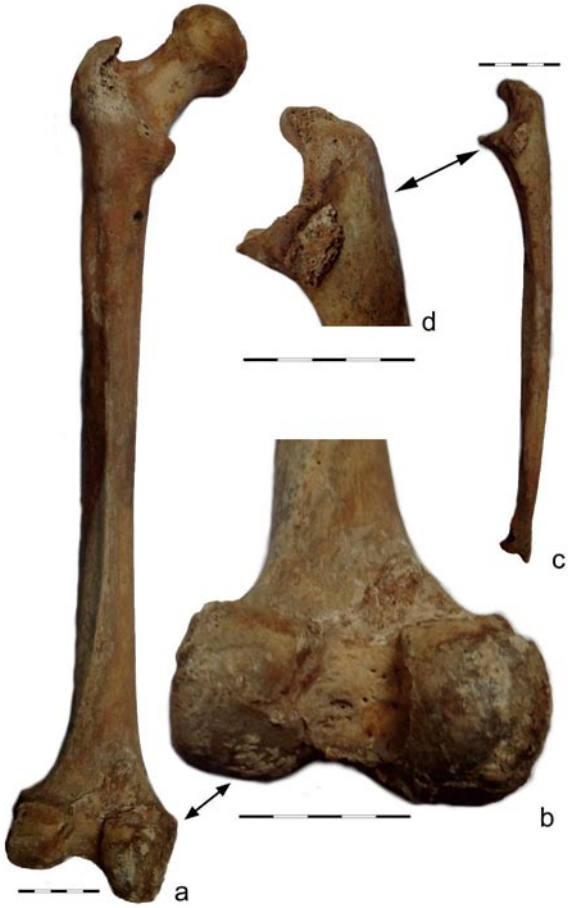

Fig. 12. Kraków-Mistrzejowice, Site 85. Feature No. 1311. a, b — left femur; c, d — right ulna

Table 4. Copper wire spiral from grave 1307, chemical composition of phases Sb-Bi-Pb, variously oxidized (in wt%)

	19a	19b	19c	24d	14a
O	12.34	5.58	11.35	7.61	6.43
Si	1.11	1.51	1.10		0.84
Fe	0.00	0.00	0.00	0.00	
Co	0.00	0.28	0.00	0.00	
Ni	0.47	0.00	0.19	0.05	
Cu	8.71	11.41	8.03	11.07	14.61
Zn	0.00	0.00	0.00	0.00	
As	1.95	3.57	0.00	3.02	0.00
Ag	1.58	1.55	1.05		3.54
Cd	0.38	0.00	0.05		
Sn	0.31	0.00	0.00	0.62	0.68
Sb	33.62	32.98	48.12	40.63	32.96
Au	0.00	0.00	0.09		
Pb	21.97	32.18	4.49	28.01	22.46
Bi	17.55	10.95	25.52	9.07	18.47
suma	100.00	100.00	100.00	100.00	100.00

their main element (Fig. 8:3). Moreover, they contain an admixtures of the following elements: Cu (8.0–14.6 wt%), As, Ag and Sn, at respectively: 3.6, 3.5 and 0.7 wt%. The significant amount of oxygen indicates that they are more likely to be oxide than metallic phases. A characteristic variation was observed in the ratio of the three main elements: Sb, Bi and Pb (Tab. 4).

The amount, occasionally relatively high, of the identified phases suggests that the original metallic phase of which the artefact was made, could have had a content of Ag, Sb, Bi and Pb at a level of a decimal value of wt% or even 1wt %. Definitely, not a trace amount.

Feature 1311

A niche feature. In horizontal plan the pit had an approximately rectangular outline rounded at the corners. At the depth of *ca* 20 cm from the level of detection it measured 90 x 80 cm, its major axis was oriented N-S. The fill was mostly brown and pale brownish in colour. The bottom of the entrance pit was found at a depth of *ca* 100 cm from the level of detection (Fig. 9:B). To the west of the entrance was the niche of the grave. Its fill consisted of mainly two visibly different contexts: light to dark brown, with patches of yellow loess; greyish-yellow (Fig. 9:B). The fill of the niche and of the entrance pit yielded a few sherds

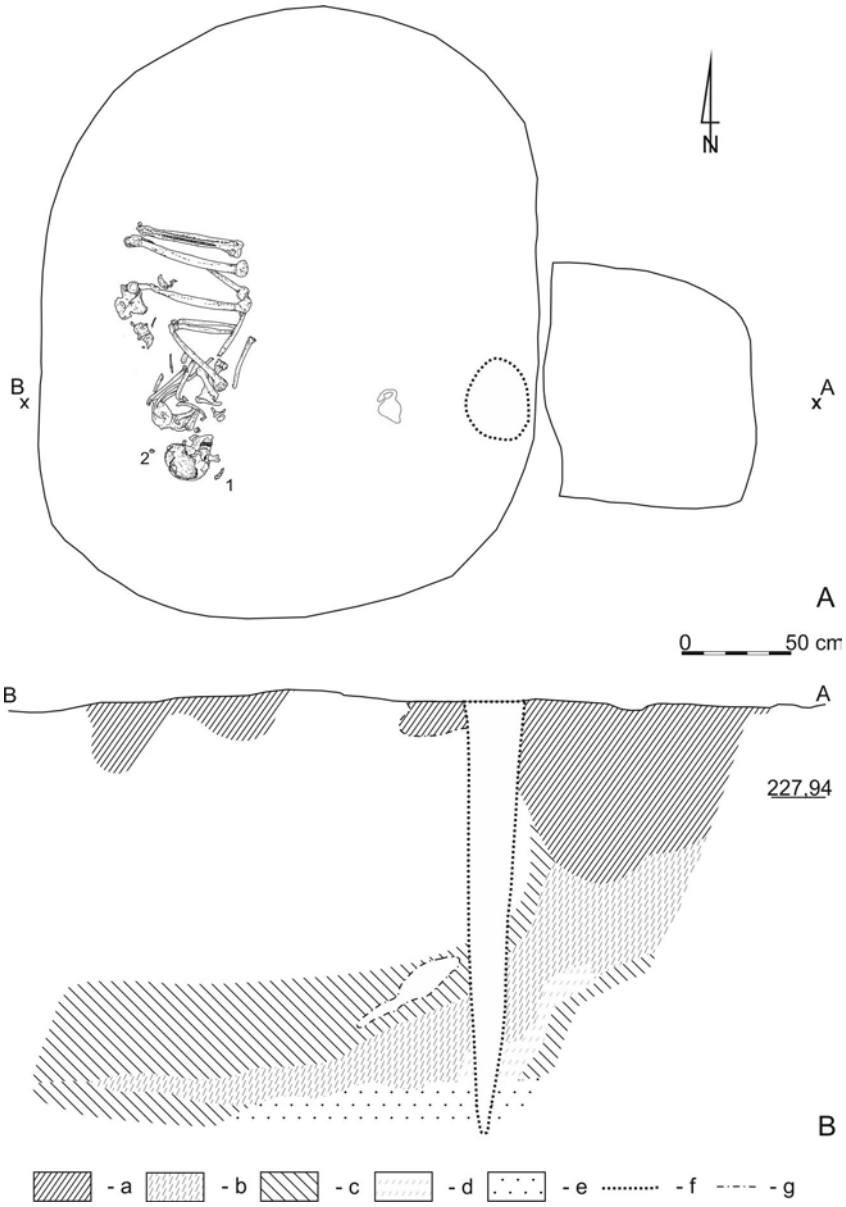

Fig. 9. Kraków-Mistrzejowice, Site 85. Feature No. 1311. A — plan of the burial; B — cross-section of the grave. Legend: a — dark brown soil, b — brown soil, c — light brown soil, d — yellow loess, e — grey yellow loess, f — the trace of borehole, g — burrows of animals

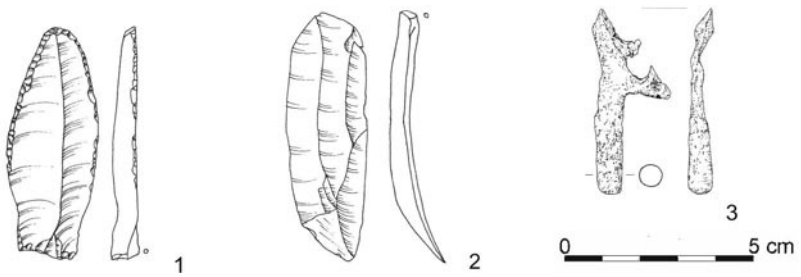

Fig. 10. Kraków-Mistrzejowice, Site 85. Feature No. 1311. Inventory of the burial

of Linear Pottery Culture which presumably entered the feature with the backfill. Near to the bottom of the niche its shape was oval, 230 x 190 cm (160 cm from the level of detection). The niche was not vaulted and had a height of *ca* 55 cm. At its bottom was a skeleton of a male (*adultus*), resting on its side, with the head and lower limbs turned to the right (Fig. 9:A). The burial had been deposited along N-S axis, with the head to the South, the face towards the niche entrance (E). Upper limb bones had been moved by animals making their original arrangement unrecoverable. The bones of the lower limbs were flexed at the hip at an angle of *ca* 55° and at the knee joint, at an angle of approximately *ca* 30°. Grave goods were discovered next to the head — flints (Fig. 10:2, 3) and near the rib cage (Fig. 10:1).

Inventory

1. Bone object — "hook" (Fig. 10:1) made from animal bone, evidently worked to produce a round-sectioned shank and a markedly thinned down and sharpened apex. On one of its faces the bone was shaped into a barb (?) with above it, another, smaller protrusion. Between the two is a broken, oval-shaped opening. Dimensions: length 49 mm, width 20 mm, diameter of shank 7 mm.

2. Blade made of type G Jurassic flint (Fig. 10:2), sides and apex with edge retouch. Dimensions: 61 x 23 x 7 mm.

3. Blade without retouch made of type G Jurassic flint G (Fig. 10:3). Dimensions: 65 x 22 x 7 mm.

4. Flake made of Jurassic flint from the Kraków region. Dimensions: 39 x 24 x 8 mm.

Physical anthropology analysis

The postcranial skeleton nearly complete, the cranium with substantial secondary damage. The surviving right fragment of the cranium vault is moderately robust, the frontal bone lightly inclined, the supraorbital margin rounded. The marginal tubercle is present

on the surviving zygomatic bone, sutures are open. The maxilla and the mandible retain almost all permanent teeth:

M3	M2	M1	P2	P1	C	I2		I1	I2		P1	P2	M1	M2	M3
M3	M2	M1	P2	P1	C	I2	I1	I1	I2	C	P1	P2	M1	M2	M3

Post mortem loss of maxillary right lateral incisor and left canine. Moderate abrasion to the teeth, with calculus visible on the surface of the crowns.

Bones of the postcranial skeleton represented by cervical vertebrae: C1-C4, C7, fragments of thoracic (8), lumbar (5) and sacrum (S4-5). Facets of articular processes in most vertebrae eroded. Partly damaged ribs of right and left side present; also, the manubrium and the body of the sternum. Right and left clavicle visibly asymmetrical (Fig. 11) — right clavicle is conspicuously shorter displaying stress lesion at the site of attachment of costoclavicular ligament (Fig. 11: b); left clavicle is longer, with the trapezoid line more pronounced than in right clavicle. Sternal ends of clavicles not fully ossified. Some damage to subscapular fossae of both scapulae. The surviving right and left humeral bones (339 mm and 339 mm respectively) are robust, with a well developed deltoid tuberosity and crest of greater tubercle. On proximal ends of both these bones are visible epiphysial lines. The bones of the forearm survive complete and also robust. The right (249 mm) and the left (251 mm) radius has a strongly developed radial tuberosity. On proximal and distal ends of these bones are visible epiphysial lines. The right (274 mm) and the left (272 mm) ulna has a strongly developed crest of supinator muscle, and moreover, on the right ulna there is ossification of a collateral ligament (Fig. 12: c, d). On distal ends of both ulnae are epiphysial lines. Surviving bones of the right and the left hand include: bones of the wrist, metacarpals and phalanges. Lower limb bones represented by left hip bone (complete) and right hip bone (substantially damaged), right (469 mm) and left (465 mm) femur, right patella, right (371 mm) and left (370 mm) tibia, right (357 mm) and left fibula, the latter with damage to the proximal epiphysis, and bones of the right and the left foot. On right and left femur the linea aspera is strongly developed, the third trochanter was also observed. Epiphysis of left femur distal with conspicuous degenerative changes (Fig. 12: a, b). On proximal ends (both femurs and tibiae) and distal ends (tibiae and fibulae) are visible epiphysial lines.

By its robusticity and strongly developed muscle attachments the skeleton is identified as male. Epiphysial lines visible on long bones establish his age as *ca* 20–25 (early *adultus*). Stature in life was calculated from long bone measurements using regression equations (Formicolla, Franceschi 1996) as 170 cm (based on the right femur) and, by averaging values of measurement of all the long bones, as 169 cm.

Between the ribs of this individual was found a partly damaged right ulna of another individual (*infans II*), very likely introduced into the grave niche by accident.

***

The preservation status of the postcranial skeleton from feature no. 1311 permitted observation of details of its anatomical structure tentative identification of activity patterns. The structure of the pectoral girdle is marked by a conspicuous difference in the length of the clavicles and presence of stress lesions at the site of attachment of the costoclavicular ligament on the right side (Fig. 11:b): a pit depression known as clavicular rhomboid fossa (Rogers *et al.* 2000). The function of the costoclavicular ligament is to stabilize the sternoclavicular articulation. Bone modifications visible in this male have been observed in individuals involved in e.g., heavy farm work (Galera, Garralda 1993) or in carrying heavy loads (Stirland 2001) which resulted in significant loading on the shoulder joint (Capasso *et al.* 1999, 52). In the analysed skeletal remains the asymmetry in the development of muscle attachments on the clavicles is likely to result from a greater loading on the right upper limb. Heavy physical activity led to more overloading, as evidenced e.g., by the ossification of the collateral ligament of the right ulna or degenerative modifications in the left knee joint. The elbow joint is vulnerable to trauma, which often leads to the development of myositis ossificans in the joint capsule, collateral ligaments and muscle insertions. These ossifications, even if usually they cause minor limitations to movement, cause no major impairment of the function of the joint (Safran 1995). In observing the development of muscle attachments in this male we have to note his relatively young age at death (20–25 years). Thus, the modifications present cannot be the due to his advanced age (cf. Millella *et al.* 2012) but, more likely, to performing heavy physical labour from the youngest age.

ANALYSIS

Excavations carried out on the site of earmarked for residential building construction brought the discovery of two more niche graves of the Corded Ware Culture at Kraków-Mistrzejowice, site 85, recorded as features nos. 1307 and 1311. They were found at a distance of about 100 m from two groups of CWC graves discovered earlier at the same location (Fig. 2:A), suggesting that they form a separate group. Because of damage to the site some elements of the construction of grave 1307 were lost and had to be reconstructed. The feature survived only as a fragment of the passage and the grave niche, entered over a *ca* 85 cm high ledge. The position of the passage indicates that the entrance pit was to the east of the niche, similarly as in feature 1311. This, at the same time, is an arrangement typical for niche graves in the Kraków-Sandomierz Group of Corded Ware Culture (Włodarczak 2006). In its construction feature 1311 differs from classic CWC niche graves of SE Poland by having only an entrance pit, which passed seamlessly to the unvaulted niche. Nevertheless, this view may be the result of the poor preservation status. Some niche graves recorded in the Lesser Poland Upland had a vertical shaft (passage) leading

to the niche. A highly similar construction is observed in feature 6556 at Modlnica, site 5 (Włodarczak *et al.* 2011, 313, fig. 6:4), another, also quite similar, was recognized in Janowice (Prokopowicz 1960, 59, fig. 2) and in the cemetery at Żerniki Górne, grave 90 (Kempisty, Włodarczak 2000, 51). If we assume that the upper levels of feature 1311 were destroyed, we can conclude that its entrance pit did not survive. With this interpretation, this grave would be a further example of a rarely encountered construction. Another difference is the presence of an unvaulted niche. Similar burial chambers are known from a CWC site at e.g., Pałecznica, feature 7 (Liguzińska-Kruk 1988, 120, fig. 7) and Wierszczyca, site 31 (Machnik *et at.* 2009, 163, fig. 128:2), and from the cemeteries of Złota Culture e.g., Książnice, graves 2 and 3 (Wilk 2013, fig. 25:3) and Złota, grave 75 (Krzak 1976, 165, fig. 72). The next difference is the position of the entrance pit and the niche relative to each other. In plan, the entrance pit is roughly rectangular, its major axis oriented N-S. We can infer that the bottom of the entrance pit and the floor of the niche were on the same level. The grave niche was aligned N-S with its major axis, the same way as the entrance pit. This is an arrangement not encountered in graves of the Kraków-Sandomierz Group where the entrance pit is at right angles to the niche.

Human skeletal remains survived in both grave features. Feature 1307 held a disarticulated burial of two individuals. Given the presence in this niche grave of only a small number of bones from a female skeleton and only the cranium of the child, it is likely that these burials were placed in the grave already in a disarticulated state. The crania had been deposited in S area of the niche, on their right side, with the facial skeleton turned to the entrance. Because of the fragmented nature of the burial the surviving arrangement cannot be easily referred to modes of burial prevalent in Corded Ware Culture. It is worth noting nevertheless that in the Kraków-Sandomierz Group female burials were deposited with the head to the North and North-East (Włodarczak 2006, 63, fig. 35). The deposition, even if only of an incomplete cadaver, in this case a cranium, in S area of the niche, is a departure from this rule. In feature 1311, the burial of an adult male had been placed on its right side, with the head South and the face to the East. This is an arrangement typical for male graves in the Kraków-Sandomierz Group (Włodarczak 2006, 63, fig. 35). The position of upper limbs is disturbed but appears to correspond to type A of A Häusler (1974), whereas the position of lower limbs is similar to type 2, possibly, type 5, of P. Włodarczak (2006, 58, fig. 31). Near to the male skeletal remains, between the ribs, was a single bone of a child (*infans II*). It may have passed into the grave by accident, but there is also a record from earlier research on a grave (feature 125) which held the remains of a man and a small number of bones of a child (Szczepanek 2011, 284). Some cemeteries of the Kraków-Sandomierz Group have yielded burials of adults and children (*infans I, infans II*). Articulated skeletons of a man and a child were discovered e.g., at Żerniki Górne, grave 130 (Kempisty, Włodarczak 2000) and at Gabułtów, grave 2 (Górski, Jarosz 2006).

Grave goods were found in both features. In feature 1307 some of the artefacts were found in the N area of the niche: pottery, bone chisels, flint tools and blanks (Fig. 3–6), the

remainder, in its W area near to the crania — a stone battle-axe, a flint axe, flint tools and blanks (Fig. 3–6). Last, but not least, a copper wire spiral was found resting on the cranium of the child. (Fig. 3–6). The jar-like pot deposited in the grave with below its rim, a decoration of impressions made with a short cordon, has close analogies to a vessel recovered at Łękawa, grave 1 (Tunia 1999, 163, fig. 4:a). The body of the specimen from Łękawa is decorated with a pseudo-textile pattern. Vessels of this type, similarly decorated, were noted in a Jevišovice Culture context (Medunová-Benešová 1977, plate I:6). Similar cordons appear also on Early Bronze Age vessels found in sites lying to the south of the Carpathian arc — in Nyírség-Zatin Culture (Vladar 1970). The second vessel, a small beaker decorated on the neck with horizontal rows of impressions of a thin cord finds analogy in e.g. a vessel discovered in feature 29 at the same site (Jarosz, Mianowska 2011, 253, fig. 11:2). Lithic artefacts and objects made of bone found in the same grave include a reworked flint axe made in Świeciechów flint, a resource used most often in the manufacture of axes attributed to the Kraków-Sandomierz Group (Włodarczak 2006, 20, 21). The axe from feature 1307 originally had a square cross-section, as shown by marks of grinding on its four faces. After multiple modifications the axe assumed an irregular cross-section. Flint axes are a frequent item of grave goods in CWC burials (Włodarczak 2006, 66–71). The retouched blade discovered in the grave (a blade "dagger" — type C of Włodarczak 2006, 32) is in Jurassic flint. This material was used often in making these implements in the loess zone of Western Lesser Poland (Włodarczak 2006, 30). The dagger has retouch on both faces, something that is rare in CWC flint tools. The rest of the grave goods and the flint blanks discovered in the grave were in Jurassic flint sourced in the region of Kraków, with a single piece probably in Cretaceous Volhynian flint. The stone battle-axe discovered was heavily eroded. Battle-axes have been elements of the inventory of mostly male graves, but in a few child burials as well where the buried individual rested inside the niche grave on their right side (Włodarczak 2006, 70).

Feature 1307 also held two bone awls which in the graves of the people of the Kraków-Sandomierz Group are present in graves containing male and female burials alike (Włodarczak 2006, 74).

The copper wire spiral discovered by the child's cranium is a grave offering that have been found in burials of men, women and children (Włodarczak 2006, 74). Out of many artefacts made of copper or copper alloy from SE Poland dated to the late Neolithic and Early Bronze Age (Kempisty 1978; Hensel 1992, Włodarczak 2004; 2006) only spirals from CWC graves, nos. 78 and 137 at Żerniki Górne (nos. 1,2,5,6; Włodarczak 2006, tab. 8) and feature 83 at Mierzanowice (no. 13; Włodarczak 2006, Tab. 8) contained a significant amount Ag, Pb, Sb and Bi, their wt percentages respectively: Ag (0.1–0.5 wt%), Pb (0.2–2.5 wt%), Sb (0.2–0.5 wt%) and Bi (0.1–1 wt%) (Włodarczak 2006). None of the other metal finds described in the cited publications was found to contain all of four of these elements.

Also characteristic for the analysed artefact is the absence of an aggregations of metallic phases containing Ni and As. A higher content of this first element was displayed by many artefacts from the Mierzanowice Culture graves (Kempisty 1978; Hensel 1992).

Copper earrings from the Corded Ware Culture cemetery at Machnówek (Nosek, Stępiński 2011) were subjected to two analyses: before and after the removal of the corrosion. The outer, corroded layer was marked by a higher content of Si, Ca and P. Interestingly enough, the mentioned above analysis has shown that content of elements such as Zn and Ni, which originate from ores used in smelting copper (Nosek, Stępiński 2011), was very similar in the corrosion layer, and in the layer remaining after their removal.

The presented analyses of the chemical composition of the investigated wire spiral revealed that its metallic elements were submitted to fractionation during corrosion and concentrated, in a varying degree, in the secondary patina phases discussed here. And so, the copper oxides, except for a minor quantity of Ag (max. 0.4wt%), do not allow other metallic elements into the crystal lattice, whereas the silver phases, other than Cu, contain some admixtures of Au, Cd and Sb. Finally, phases Sb-Bi-Pb were found to accumulate — next to Cu and Ag — also a minor quantity of elements such as As and Sn.

The absence in the investigated fragments of the original (unaltered) metal used in making the artefact prevents the determination of chemical composition. However, basing on the presented evidence, we can conclude with some confidence that similar copper ores were used in smelting the metal occurring in objects discovered in the graves at Żerniki Górne and at Mierzanowice. A distinguishing attribute of these copper ores was the presence in them of sulphosalts of Sb of Bi.

Compared to feature 1307, the burial in feature 1311 had modest grave goods: just two flint artefacts and a single object made of bone, discovered inside the niche. The flints were deposited next to the head of the burial; their material is type "G" Jurassic flint, rarely used in the manufacture of these artefacts (Włodarczak 2006, 30). A more remarkable object discovered in this grave is a bone hook. This is a form not recorded earlier in grave inventories of the Kraków-Sandomierz Group.

The position of the grave offerings in the niches of the two features is typical for the Kraków-Sandomierz Group, where the grave goods are usually found near the hip, behind the back, or below the lower limbs of the burial. A usual placement for stone or flint objects is near the head (Włodarczak 2006, 70, fig. 39).

The two further graves of Corded Ware Culture discovered in site 85 in Kraków-Mistrzejowice are likely to belong to a separate, small group of burials situated partly in the elevated part of the loess ridge. Similar small grave groups established within the same one relief form were recognized in the nearby cemetery at Modlnica (features under barrows and niche features; Włodarczak *et. al.* 2011, 308, fig. 1) and Batowice (Krauss 1960). This is a location typical for cemeteries of CWC in the loess zone of Western Lesser Poland, on a summit or close to it, above the river valley bottom. The cemetery at Kraków-Mistrzejowice is another in a series of sites discovered on the Lower Dłubnia (cf. Zamełka 1959; Sochacki 1964; Hachulska-Ledwos 1967; Górski, Włodarczak 2000, 11, fig. 1), attributable to the Batowice Sub-group (concentration/group A of Włodarczak 2006, 79). The traits of the burial rite described earlier, which apply both to the form of the grave and the deposi-

tion of the burial, correspond to the rules prevalent in the Kraków-Sandomierz Group (Machnik 1966, Kempisty 1978, Włodarczak 2006). The grave goods found in feature 1307 indicate the chronological position of the described features as phase IIIb in the development of CWC in the loess region of Western Lesser Poland (Włodarczak 2006), which corresponds to 2500–2300 BC (Jarosz, Włodarczak 2007, 89, fig. 11). Very likely, this should also be the dating of the time of construction of grave 1311. Burial features recorded so far on the Lower Dłubnia can be attributed also to the same developmental phase of CWC. Similarly as most of the graves at Modlnica, site 5, found more to the west, in the drainage basin of the Prądnik (Włodarczak *et al.* 2011, 331). In the lower reaches of the Dłubnia and Prądnik also the earlier phase of CWC development is represented, in a site at Modlnica (Włodarczak *et al.* 2011, 330) and at Kraków-Prądnik Czerwony (Rook, Nowak 1993).

In conclusion let it be noted that the Corded Ware culture at Kraków-Mistrzejowice site 85 described here, even with the destruction of some features has potential to improve our understanding by yielding further valuable finds in a so heavily transformed area lying within the city limits of Kraków. So far the loess hill at Mistrzejowice has yielded a total of eight graves of Corded Ware Culture, the largest concentration of sepulchral features on the Lower Dłubnia. The findings from the rescue investigation of this site confirm intensive use of this area, both for habitation and for burial.

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