Časopis Národního muzea, Řada přírodovědná
(J. Nat. Mus., Nat. Hist. Ser.)
Vol. 173 (1–4): 129–132, 2004

Anthropology

The use of recently re-discovered glass plate photodocumentation of those human fossil finds from Předmostí u Přerova destroyed during World War II.

Jana Velemínská[1], Jaroslav Brůžek[2,3], Petr Velemínský[4], Alena Šefčáková[5] and Stanislav Katina[6]

[1]*Department of Anthropology and Human Genetics, Faculty of Natural Sciences, Charles University, Praha, Czech Republic; velemins@natur.cuni.cz*
[2]*UMR 5199 de CNRS, PACEA - De la Préhistoire à l'Actuel : Culture, Environnement, Anthropologie, Université Bordeaux I, Talence, France*
[3]*Department of Social and Cultural Anthropology, Faculty of Humanities, University of West Bohemia, Plzeň, Czech Republic*
[4]*Department of Anthropology, National Museum, Praha, Czech Republic*
[5]*Department of Anthropology, Slovak National Museum, Bratislava, Slovakia*
[6]*Department of Probability and Mathematical Statistics, Faculty of Mathematics, Physics and CS, Comenius University, Bratislava, Slovakia*

Received April 27, 2004 Accepted June 15, 2004

Abstract. This article considers the opportunities available for the use of the photographic documentation of a collection of Upper Palaeolithic fossil finds from Předmostí u Přerova that was definitively destroyed during the Second World War. The dimensions read off using Craniometrics software are comparable to the direct measurements of the skulls taken by Matiegka (1934). The results demonstrated the concordance of the two techniques, and the practicality of using glass plate negatives in modern morphometry.

■ **Upper Palaeolithic, Předmostí, human skulls, craniometric software, measurement error**

INTRODUCTION

The bone remains of close nearly thirty skeletons from Předmostí near Přerov are among the most important findings of anatomically modern man in the world on a worldwide scale. They were discovered by Jindřich Wankel, Karel J. Maška and Martin Kříž already in the second half of the 19th century, by Karel Absolon in the first half of the 20th century. The fossils are accompanied by gravettian industry. Their estimated age is between 25 and 27 000 years (Svoboda 2001). They are still part of the most extensive sample from the Upper Paleolithic; moreover they are very homogeneous and thus quite rightly considered a representative sample of the whole group or a population.

The first anthropological evaluation was made by Jindřich Matiegka who published his findings in a report in two volumes in Czech with a French summary. It is not surprising that already since the 1930's to the present time this material has been systematically used as a reference series in textbooks as well as monographs, in theses, as well as scientific publications in general. Unfortunately, the significance of the study on the sample

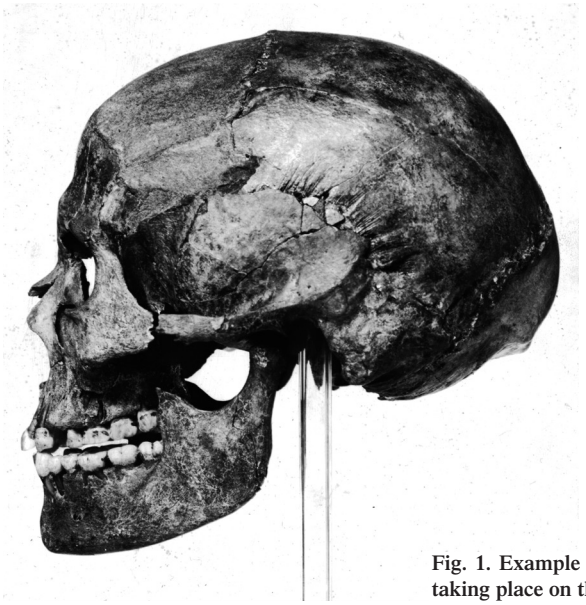

Fig. 1. Example of the irreversible destructive processes taking place on the negatives.

of the Gravettian population from Předmostí was greatly lessened by the fact that at the end of the Second World War, the material was forever destroyed by a fire of the Mikulov Castle in the year 1945.

The only source of information, which remains, is the above mentioned publication of Matiegka with a series of photographs. The casts of skulls Předmostí 3 and 4 and endocranial casts Předmostí 3, 4, 9 and 10 housed in the collections of the Moravian regional Museum in Brno is also preserved (Jelínek, Orvanová 1999). The discovery of Matiegka's original documentation on glass plates negatives dates from this time and it makes possible the new insights of the skeletal samples of 27 subjects of different age and sex.

In the new metric processing of these glass plates, the authors sought to verify the possibilities afforded by digital reading of the dimensions from professionally scanned photodocumentation. This contribution thus considers the reliability of the measurements, whereby the results of the digital measurements taken from the photographs were compared to Matiegka's published data. Where the differences are statistically acceptable (reliability coefficient values of over 0.8), it is possible to consider the application of new morphometric approaches unknown in the 1930's.

In addition to the anthropological analysis of the negatives, primary tasks naturally included their conservation, expert investigation and archiving of the negatives, which are subject to irreversible processes of destruction (see Fig. 1).

MATERIALS AND METHODS

The material used comprised the professionally digitised historic photographs of the skulls from Předmostí. The authors used photographs of 4 adult skulls (Předmostí 3, Předmostí 4, Předmostí 9 dx, sin and Předmostí 10 dx, sin) in the left or right lateral norm. Fig. 2 shows an example of the quality of the skull photographs, professionally

Fig. 2. Skull n. 9, locality Předmostí near Přerov. The image is a part of the Matiegka collection of photographs at Department of Anthropology and Human Genetics, Faculty of Natural Sciences, Charles University, Prague.

scanned with a view to studying the craniometric points. In order to establish the reliability of the new measurements, 11 dimensions measured by Matiegka were selected (see Table 1; Bräuer 1988). The values published by Matiegka (1934) were compared with the new values, calculated using Craniometrics software. Given that the skulls were photographed without the use of real scales, the best identified dimension on the skull photograph (nason-bregma) was taken as the scale.

The Craniometrics program was created for the detailed cranio-facial metric analysis of lateral X-ray films of patients with clefts. It was developed in the MS Excel format and enables a one-off measurement of a required number of selected metric traits of the cranium and face to be carried out (Velemínská et al. 2003).

The differences between the two measurements types were assessed by calculation of the error standard deviation after Dahlberg, referred to in the English literature as the

Table 1. Mean values of 11 investigated characteristics, inter-individual, systematic and intra-individual error between different types of measurement of lateral X-ray films.

Dimension	mean 1 (our measur.)	mean 2 (Matiegka, 1934)	s^2_{ch}	s^2_{celk}	R (inter-obs. error)	pair t-test(p) (systemic error)
N-B	114.69	114.67	0.01	12.26	1	0.44
N-L	183.08	182.33	3.49	55.97	0.94	0.35
N-I	180.64	180.33	1.89	53.7	0.96	0.94
G-Op	196.29	192.5	18	138.21	0.87	0.23
B-L	116.59	115.67	3.57	40.91	0.91	0.14
B-I	158.51	155.67	7.01	59.76	0.88	0.12
G-L	184.91	183.67	5.96	97.2	0.94	0.32
G-I	188.8	185.17	7.69	76.16	0.9	0.1
N-Me	116.78	113.83	12	63.85	0.81	0.09
N-Pr	67.8	67.67	1.95	29.49	0.97	0.71
N-tip I_1	76.89	76.17	0.91	34.96	0.97	0.04

TEM (technical error of measurement), from which the coefficient of reliability (R) is derived. In addition to the coefficient of reliability (e.g. Šmahel 2001) the authors determined whether or not the digital apparatus was affected by systemic error, an assessment made using the t-test for paired samples (see e.g. Utermohle et Zegura 1982).

RESULTS

The results were unexpectedly positive, and are summarised in table 1. The coefficient of reliability between the direct measurements from the skull and the digital measurements of the photographs proves the high reliability of the latter method (0.87–0.97), while only in the N-Me dimension was a lower coefficient (0.81) found, this evidently caused by the incomplete occlusion between the jaws and the localisation of the mental point. The systemic error was significant at the lowest level of significance in only one of the dimensions, and this is judged to have been by chance.

DISCUSSION

The identified indicators of the reliability of the measurements are comparable with the results of inter-observer error found in a representative sample (N=36) of digitally-measured lateral X-ray films of patients with facial clefts (Velemínská et al. 2003). The results also correspond to those of other authors who have investigated errors in direct measurements in craniometry (Kouchi et Koizumi 1985; Utermohle et Zegura 1982).

The high correlation between the direct skull measurements and the digital measurements from the photographs of Předmostí's fossils open the way for more detailed metric processing of the photographs. Verifying the methods and gaining new morphometric information regarding the Upper Palaeolithic populations allows for the comparison of skulls and thus entire populations with other historical finds, both in the chronological and the geographic perspectives.

ACKNOWLEDGEMENT

This project was supported by grants from the Grant Agency of the Czech Republic (GAČR, project 206/04/1498GAUK C270/2004/B-BIO/PrF) and the Slovak Grant Agency (VEGA, projects 1/0272/03).

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