NEW METHODS OF INVESTIGATION OF BONE REMAINS FROM CREMATION GRAVES

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The cremation rite is one of the oldest forms of burial of the deceased. Cremation burials on Polish territory are found dating as far back as the Neolithic age. Later, in the Bronze and Iron Ages, they become more and more frequent. They lasted in Poland for a long time, until as late as the 11th and even 12th century.

As known, this rite is characterized by a great variety of forms. One of them are urn graves in which burnt bones and remains of ashes, taken from the pyre, were placed in a special clay vase — the urn, buried afterwards in a whole dug in the earth. In pit graves the burnt bones, mixed with the remainders of the funeral pyre, were buried directly in the earth. Quite often the bones and remains of the pyre formed a heap, or a layer spread flatly over a certain area. It also happened that after burning down the pyre was simply covered with sand or soil of which various kinds of mounds were made.

The contents of cremation graves are, naturally very scant. Slavonic urns are, as a rule, poorly furnished and often they contain no burial gifts. When any utensils are found in cremation graves, they are, first of all, tools of everyday use, as metal knives (bronze or iron ones), arrowheads, spurs, or buckles — often found in the shape of remains, or as lumps of molten metal difficult to identify.

Earthenware, found in the shape of fragments in very numerous cremation graves, is quite resistant to the action of fire. Nevertheless, things made of less durable materials are found, too, such as remains of bone combs, glass beads, spindle whorls etc.

There were very few studies of bone remains from cremation graves until not long ago, on account of the circumstance that traditional anthropometric methods could not be applied in this instance. Anthropologists were discouraged by the incompleteness of the material, its fragmentation and considerable deformation. It should, however, be underscored that bone débris from cremation graves are often the only material capable of supplying information on the biomorphological structure of the investigated human group. Some extinct population had only a funeral rite of this kind and should one give up important data, were these materials to remain unexploited. One of the first attempts at a methodical investigation of bones from cremation graves was undertaken as early as 1928 by the Polish scientist, A. Wrzosek [1], (if we do not take into account the work of the Poznań physician and archeologist, Klemens Koehler [2], dating from 1885). Wrzosek's materials, worked out in cooperation with M. Ćwirko-Godycki, came from a Lusatian cremation cemetery at Laski in the Kępno district. The proposed method consisted in the sifting of the ashes from the urns through a sieve. The pieces selected in this manner were thrown upon an oil cloth and suitably segregated with a special brush. This enabled the researchers to determine the number of subjects in the urn and sometimes even their sex. The material from Laski was also analysed by G. Madzirska-Langer and J. Maćkowski [3]. They investigated the dentition of this population. Among the fragments of numerous teeth they were able to segregate 123 well preserved crowns and 305 roots. On the teeth they found neither caries nor other pathological changes, or any special differences as compared with contemporary populations. In contradistinction to Wrzosek's work, this paper did not bring any new contributions to problems of methodology.

My method of analysis of bone débris from cremation, described in the years 1956, 1957 and 1960 [4—7], is based upon the assumption that in various types of the cremation rite found on Polish territory only exceptionally all bones were completely burnt. Most often quite appreciable amounts of more or less burned through bone pieces were found in urns or grave pits. Recently this method was supplemented by new observations based on original material [8—16], and that is why I consider it appropriate to present the method in the present report.

The careful gathering of all bone fragments, and even of their crumbs, is the fundamental condition of the study of cremation material. Needless to say that bone remains from various centres have to be placed in separate boxes, respectively bags, and labelled precisely on the spot.

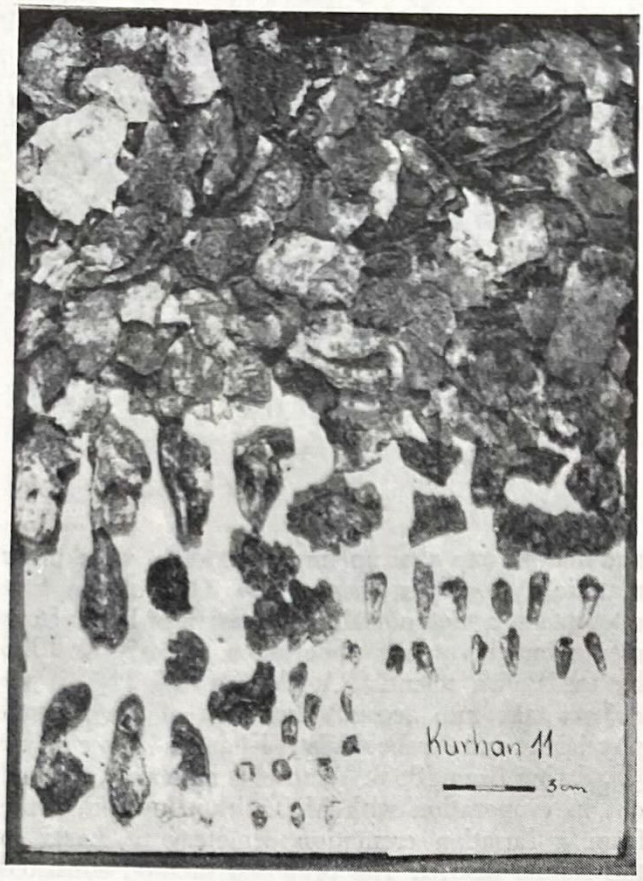

FIG. 1a.

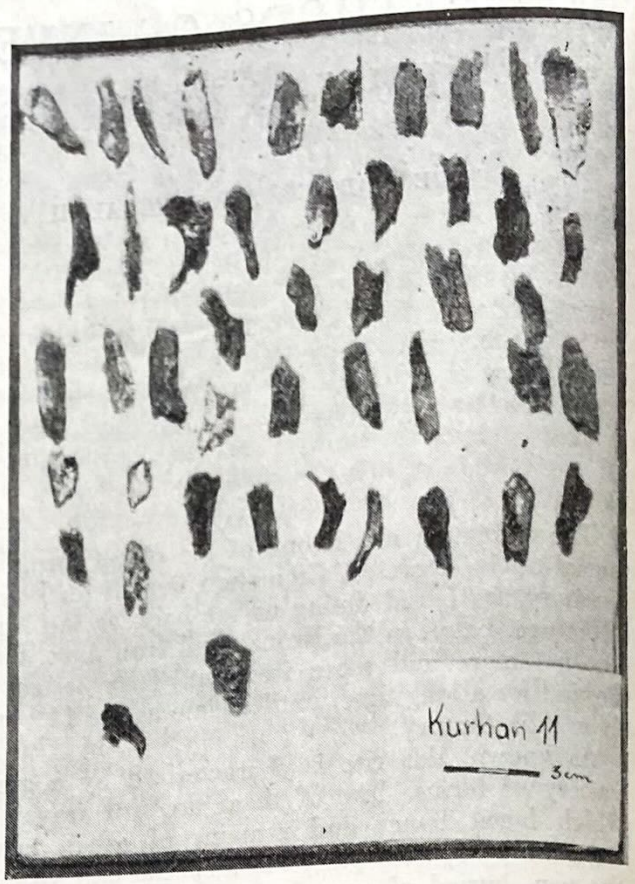

FIG. 1b.

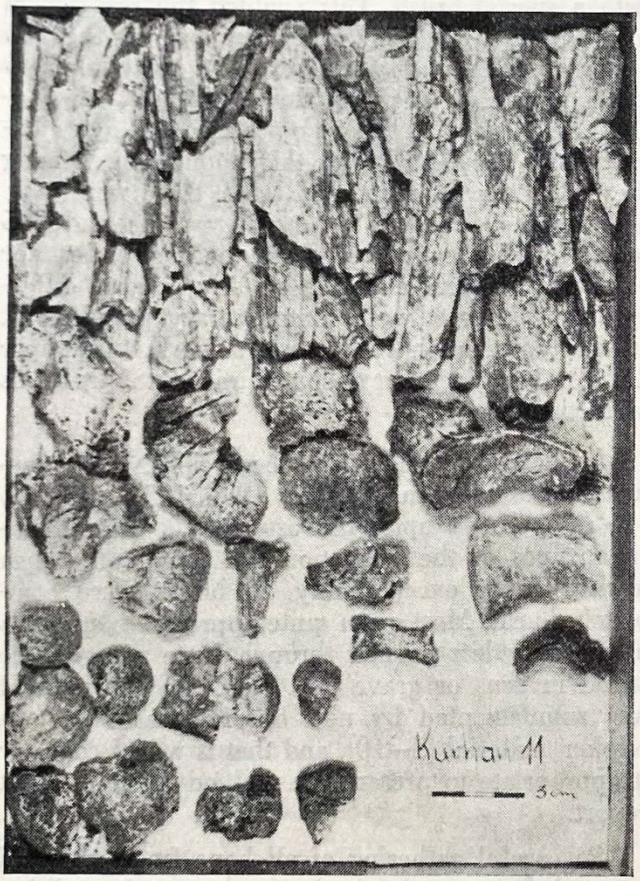

FIG. 1c.

FIG. 1d.

Bones from mound No. 11 of the cemetery with cremated burials of the Jacwings at Osowa

a — bones of the head
b — bones of the trunk
c — bones of the upper extremity
d — bones of the lower extremity

Human bones, altered under the influence of high temperature and direct action of the fire, exhibit quite characteristic deformations: their *substantia compacta* is mostly bent and cracked, and often it has a bluish coloration. This coloration may often better be seen directly under the *lamina* of the *substantia compacta*, in the layer of the *substantia spongiosa* or in *diploë*. As the fire usually acts upon bones surrounded by organic components (muscles, fascia, periosteum), very often the smaller long bones become characteristically bent and deformed by the high temperature. Some bones embedded in a thick layer of soft tissue have great chances to be preserved. As a rule, the bones which belong here are the pyramids of the temporal bones, the bodies of the vertebrae, the sacrum, etc.

All the investigated bones should be, first of all, carefully segregated and already at the beginning separated from animal bones. Then, the bone fragments are divided into five groups: I. bones of the head, II. bones of the trunk, III. bones of the upper extremities, IV. bones of the lower extremities, and V. non-identifiable bones. In each of the enumerated groups (the last one excepted), even the smallest fragment has to be determined anatomically. The thus segregated material already permits to establish, whether we are dealing with the remains of one or several subjects. Subsequently, the shape, size and thickness of the various fragments is a basis for the establishing of the individual's age, and often of the sex of the subject investigated.

On the epiphyses and ends of diaphyses of long bones the traces of the not yet ossified intermediate (epiphysal) cartilage *(cartilago epiphysaris)* are left in the shape of characteristic "grooves" which give an idea of the degree of ossification of these bones; this makes it possible to define the age of younger subjects. Also the state of closing of the skull sutures, and the condition and quality of "cremation" on the borders of the joined flat bones of the head supply a basis for determining the age of older subjects.

The age is determined with greater accuracy by means of the teeth, of which a considerable part is, most often, not totally destroyed by fire. Deciduous teeth or tooth buds serve for the determination of the children's age. Particularly the tooth buds, sticking in the diaphysis of the upper or lower jaw, are to a small extent exposed to the fire and, in general, they are well preserved. They can almost always be found in children's cremation graves. The degree of wearing off of tooth crowns (but taking into account the quality of the food!) and other details of tooth structure are also a valuable basis for determining the age.

The determination of the sex is more difficult, as we know that only the sex of adult objects can be determined by means of the skeleton. In this instance we are guided by the general build of the skeleton, the morphology of various bones like the frontal, occipital and parietal bone, paying particular attention to brow ridges, frontal and parietal bosses, the *protuberantia occipitalis*, neck lines etc. Of no small importance is the shape of the lower diaphysis, the position of its *processus condylares (articulares)*, the *margo posterior rami mandibulae* and its angle which can be of aid for the determination of the species. The same concerns the *protuberantia mentalis*. Apart from the skull, we also pay attention to the shape of the clavicle, the first rib, the morphology of the parts of the pelvic girdle and the sacrum, and also to the structure of muscle insertions, configuration of articular surfaces, and the size and thickness of epiphyses. A certain part is played by numerous, apparently petty details whose diagnostic significance is very important for an experienced scientific worker — in a syndrome of characters.

Among bones from cremation graves we often find orbital fragments of frontal bones which, while more massive, are to a lesser extent exposed to destruction. Also the *processus articularis* of the lower jaw, placed in the *fossa mandibularis* at the basis of the skull and surrounded by a substantial layer of muscles, has great chance to be spared by the fire.

When taking up the description of the material, the researches should, first of all, separate the individuals one from the other, which is often very difficult, and then segregate the bones according to the above scheme into bones of the head, of the trunk, and extremities, leaving also the group of non-labelled bones. This group, according to the skill of the researcher, should include as few specimens as possible. It is also appropriate to indicate the approximate size of the preserved fragments, as — according to the material used (wood), and to the size of the funeral pyre, and even the season of the year (the moisture degree of the wood), the degree of burning through of particular bone parts varies [17].

These data which are mutually complementary and — I repeat — when treated always as a whole, enable the scientists to determine, in the investigated grave or group of remains, the number of subjects, their age, sex, and sometimes even their adherence to a certain racial variety. The weight of the individual fragments, supplied by some researchers, is variable to such an extent and depends on quite incidental factors that I consider superfluous to determine it.

It is well known that material from cremation graves is crushed up to a very great extent, therefore it is difficult to determine in it anatomo-pathological changes and deformations of the individual bones, the more so because — as I have mentioned it above — the action of high temperature by itself deforms the bones to a very great extent. It is, however, not impossible to make these determinations, when the material is carefully analysed and suitably prepared. Thus, the obtained results are much better.

In recent times the interest in human bone remains from cremation graves has considerably grown, and the substantial widening of the scope of anthropological research with so far narrow

limits of racial determinations drew also the attention to the Polish research methods.

In conclusion I should like to very perfunctorily peruse some interesting works concerning the analysis of bone materials from cremation graves. Interest in this problem appeared everywhere. Thus, in 1954 G. Theiss and H. Grimm [18] described 17 cremation graves at Randau, paying attention to the colour of the bones, the degree of their cremation, their thickness and shape, and indicating also their weight. After a suitable segregation, they determined the approximate age of the deceased and their sex.

S. J. De Laet (1954) [19] also quotes two cases of description of bone remains from cremation graves. The first one concerns a find made by E. Joly in the region of Mont de L'Enclus. These bones were studied by C. Krumbein. His determination of the age of the deceased is inaccurate (e.g.: two women 40 to 60 and 20 to 40 years old; a man aged 40 to 60; two children more than 7 years old and about 7 to 14). — In the second case the bones come from a Halstatt culture cemetery at Aalter Oostergem and were studied by F. Twiesselman. His results are even less precise.

A special attention deserves the study of cremation materials from Vallhagar made by N. G. Gejvall [20]. He investigated 92 grave groups (units), containing 68.7 litres and about 250 000 bone fragments, among which he segregated skeleton parts which could be identified. On this basis he tried to establish the number of persons, their age and sex. His method takes into consideration the "volume" of the find (in litres), its weight, degree of burning and the colour of the bones. He also indicates some of their dimensions, as e.g. the thickness of flat bones of the skull, of the diaphyses of long bones etc. Gejvall statistically calculated the numerical results obtained. The omission of extremely important demographic conclusions is a serious fault of the study.

In England, too, researchers recently took up studies on cremation burials. Calvin Wells [21] studied material coming from urn cemeteries at Illington and Norfolk. Of 212 urns found he studied 104 better preserved ones. He encountered great difficulties in segregating fragments of long bones, particularly when the burial place contained remains of several individuals, as this, of course, is not an easy task. The author even tried to diagnose anatomo-pathological changes on bones, e.g. finding on vertebrae traces of *arthritis deformans*, but he hardly was able to determine the sex which, in our opinion, should not cause greater difficulties in the case of individual graves. Very valuable are Wells' reflections concerning the technique of cremation. He points to the occasional incomplete burning of the bones of the spine and shoulder blade which he considers to be a consequence of heaping the pyre over the corpse. This suggestion ought to be also confirmed by the better preservation of occipital bones. In the case of the deceased being laid with his abdomen on the pyre, facial bones, pericentral parts of clavicles and patellas are incompletely burnt. He also points to the appearance in some urns of oval, brilliant clumps of the size of pea seeds, weighing about 45 g. He considers them to be a result of the action of high temperature on hair which does not burn on account of being soaked with fat and liquids of the body [22]. The author quotes a number of observations and analogies, taken from the contents of contemporary crematoriums where he found a similar phenomenon. These latter observations throw a light upon many processes occurring during the cremation of corpses and, as I already mentioned, all this is of importance for the condition and appearance of bone remains.

We remark a great interest in cremation graves in Czechoslovakia, too. A quite appreciable number of reports on this subject appeared there. I shall mention here the work by Chochol [23]. He studied bones from Czech cemeteries of the Lusatian culture. In his report he describes the results of studying 30 graves in which he discerned 37 individuals. The procedure indicated does not contribute any new methods for the problem discussed here. K. Hajniš [24] treats a similar subject.

Polish studies of cremation materials are already very numerous. Although the specialized archaeological literature on this subject exceeds the scope of my article. I cannot omit J. Kostrzewski's monograph on the cremation rite in Slavs [25].

Of other anthropological studies, apart from the above papers, one should quote the aforementioned paper by A. and A. Malinowski concerning cremation burial places at Biernatki and the report by A. Malinowski on cremated bones from Kotul [26]. These studies deserve particular attention on account of the painstaking manner of presenting the material.

A continuation of the study of 34 years ago is the paper by A. Wrzosek and M. Cwirko-Godycki on bones from cremation graves of the Lusatian culture at Laski [27], and also papers by F. Wokroj [28], B. Miszkiewicz [29], L. J. Łuka and J. Gładykowska-Rzeczycka [30], J. Kozikowska [31], M. Zeylandowa [32], and others.

All these studies based upon Polish original research methods contribute to elucidate many social and economic, demographic and racial problems concerning the prehistoric life on our territory. Their importance for archaeology and the history of material culture probably needs no justification.

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